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ROYAL COMMISSION ON TUBERCULOSIS (HUMAN AND BOVINE).

FINAL REPORT OF THE ROYAL COMMISSION

APPOINTED TO INQUIRE INTO THE RELATIONS OF

HUMAN AND ANIMAL TUBERCULOSIS.

PART II. APPENDIX.

VOLUME III.

REPORTS ON INVESTIGATIONS

DEALING WITH

1.—Certain Human Viruses of Irregular Type.
2.—The Excretion of Tubercle Bacilli in the Milk of Animals.
3.—Swine Tuberculosis.
4.—Immunity.

BY

A. STANLEY GRIFFITH, M.D., and F. GRIFFITH, M.B.,

TOGETHER WITH

Two Reports submitted to the Commission in 1906 by Dr. L. COBBETT.

Presented to both Houses of Parliament by Command of His Majesty.

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PREFACE.

This volume contains the Reports of four separate investigations carried out at Stansted under the direction of the Commission, the first two being the work of Dr. A. Stanley Griffith alone and the others of himself and Dr. F. Griffith jointly.

The first Report, dealing with Human Viruses of Irregular Type, is divided into three parts, two of which refer to further investigations of certain viruses that had already been investigated by Dr. Cobbett and placed provisionally by the Commission in a group by themselves. The details of the previous investigation of these viruses will be found in the Commission's Second Interim Report and Appendix. The third part deals with the cultures isolated since the issue of the Second Interim Report from two human viruses that exhibited similar features to those other irregular ones placed in Group III.

The second Report in this volume gives the details of an investigation in connection with the excretion of tubercle bacilli in the milk of animals (goats and cows) after experimental inoculation. The results of Dr. F. Griffith's investigations into the excretion of tubercle bacilli in the milk of similar animals naturally infected with tuberculosis, but showing no evidence of disease of the udder, have already been published in the Commission's Third Interim Report and Appendix issued in 1909.

The investigation of Swine Tuberculosis, which forms the subject of the third Report contained in this volume, was carried out at Walpole Farm. The experiments were commenced by Dr. A. Stanley Griffith and, after he was transferred to Blythwood Farm, continued by Dr. F. Griffith.

The whole of the experimental work on which the last Report, namely that on Immunity, is based was carried out by Dr. A. Stanley Griffith and Dr. F. Griffith jointly at Walpole Farm.

Two Reports submitted to the Commission in 1906 by Dr. Cobbett on certain investigations carried out by him at Blythwood Farm are also included in this volume. These Reports deal with the Stability of Virulence of Tubercle Bacilli in the Living Body and Experiments with Mixed Viruses. They are referred to in the Second Interim Report of the Commission (pages 41 and 42), but as the experiments were of a preliminary nature the Reports on them were not included in the Appendix to that Report. The two Reports have not been revised by Dr. Cobbett to include subsequent experiments on the same subjects carried out at Blythwood, but are now printed as originally written by him.

EDWARD J. STEEGMANN.

2000. Wts. T.L. 277 & 13670. 12/08. 32. 27676D.

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(*c*) Results of the Special Investigation of the two Cultures H 60. "W.B." (Bronchial Gland) and H 90. "I.P." (Retroperitoneal Gland), isolated since the 2nd Interim Report, which exhibited the features of the two Group III. Cultures.

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BY

A. STANLEY GRIFFITH, M.D.

INVESTIGATION OF CERTAIN HUMAN VIRUSES OF IRREGULAR TYPE.

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RESULTS OF THE FURTHER INVESTIGATION OF CULTURES FROM THE VIRUSES PLACED IN GROUP III.

INTRODUCTION.

In the 2nd interim report the results are given of experiments with certain viruses, which, on account of their exceptional features, were put together in a separate group (Group III.).

The cases differed widely, and included—

(1) A virus of a character intermediate between Group I. and Group II. (H 49." T.C.").

(2) Viruses in which a eugonic bacillus of low virulence had been replaced by a dysgonic bacillus of high virulence (" Passage " experiments H 16." J.H.", H 13." A.D.", H 17." Sp.B.").

Two possible explanations of the cases were put forward and discussed by the Commission.

The first was that the results obtained were due to a mixture of viruses, of a virus from a human source and a virus from a bovine source, each possessing stable characters.

The second was that tubercle bacilli under conditions as yet not definable may manifest instability, and may, when subjected to vital influences, such as are supplied by human or bovine tissues, become modified in character.

A definite decision as to which of the two views is the true one was held over pending further work with the cultures obtained at various stages of the experiments. All the work in connection with these original experiments, which are detailed in the Second Interim Report and summarised in this, was done by Dr. Cobbett.

The further investigation of the cultures was entrusted to me, Dr. Cobbett being unable to complete the work on account of his appointment to the Chair of Pathology in the University of Sheffield, and I was directed by the Commission first to test the cultural characters and the virulence of the cultures that existed of the various viruses which had been included in this group (Group III), and then to investigate specially those cultures which exhibited any want of accordance between cultural characters and virulence.

In order to save the necessity of referring to previous reports for the origin of the cultures, a brief summary, illustrated by marginal diagrams, is given of all the viruses reinvestigated.

These viruses are H 13." A.D.", H 16." J.H.", H 17." Sp.B.", and H 49." T.C.".

Cultures from the virus H 2." Sp.A.", the original material of which was mixed sputum, were also investigated.

The further investigations with the lupus virus H 53. " D.H.," which had been provisionally included in Group III, are recorded in Volume II of the Appendix.

VIRUS H 2. " Sp. A."

(*Mixed Sputum.*)

RECAPITULATION.

Two heifers, Nos. 11 and 13, were fed every day with sputum from persons suffering from pulmonary tuberculosis, one for about 200, the other for about 300 days. Heifer 11 was killed 209 days after the experiment began ; several mesenteric glands and a few hepatic lymphatic glands were found to be tuberculous, caseous and calcareous, and there was a pedunculated growth on the lung. An emulsion from the mesenteric glands, injected subcutaneously into a calf, gave rise to general though not fatal tuberculosis.

Human Sputum.
(8. v. 02.)

Heifer 11.	*Heifer 13.*
Fed. Killed 209 days. Local Tuberculosis.	Fed. Killed 303 days. Local Tuberculosis.
Calf 79. Subcut. Killed (ill) 71 days. G.T. not severe.	Calf 111. Subcut. Killed 138 days. Focus in prepectoral gland.
Six calves of which Calf 93 (Intrap.) was one. G.T. in all.	Guinea-pig 690.

Emulsions from various lymphatic glands of this second animal injected into six calves, two subcutaneously, two intraperitoneally, and two intravenously, gave rise to general progressive tuberculosis fatal in the two inoculated intravenously but not in the others within 90 days.

In the other heifer, No. 13, calcareous mesenteric glands were found after death. An emulsion from these calcareous glands, injected subcutaneously into Calf 111 gave rise to a small nodule in a prepectoral gland only, while the same emulsion passed through a guinea-pig produced in one calf fatal generalised tuberculosis, and in another slight retrogressive tuberculosis.

A culture isolated from the prescapular gland of Calf 111 through Guinea-pig 690 was found by Dr. Cobbett to be eugonic and to have low virulence for the calf and rabbit ; it produced in broth a well-marked acid reaction (A.S.G.). A culture from Calf 93, one of the six calves inoculated with the virus from Heifer 11, grew less well than the culture from Calf 111 and was fully virulent.

RESULTS OF REINVESTIGATION.

Two strains of the virus existed, the one derived from Calf 93, the other from Calf 111.

Virulence Tests.—The culture from Calf 93 was retested after three years eight months' artificial cultivation. A series of five rabbits was inoculated, two intravenously, two intraperitoneally, and one subcutaneously. The subcutaneous rabbit died of heart disease in five days ; the others died of general tuberculosis in from 18 to 33 days. The culture derived from Calf 111 was tested after three years three months' artificial cultivation. A series of seven rabbits was inoculated, two intravenously, two intraperitoneally, and three subcutaneously. All were killed after 111 days and showed slight retrogressive tuberculosis only.

Cultural Characters.—The culture from Calf 93 grew moderately well on glycerin media but not better than the more easy growing cultures of bovine origin. The culture from Calf 111 grew luxuriantly like the human tubercle bacillus.

Summary.—The Calf 93 strain exhibited the characters of a bovine tubercle bacillus ; the Calf 111 strain those of a human tubercle bacillus.

VIRUS H 13. "A.D."

RECAPITULATION.

Tuberculous material obtained from the bronchial glands and spleen of a child, aged 4 years, who died of acute generalised tuberculosis, was mixed and inoculated subcutaneously into two calves and gave rise in each to a very limited retrogressive tuberculosis confined to the seat of inoculation and nearest glands.

Bronchial Glands
and Spleen.

Calf 129.
Subcut.
Killed 66 days.
Local Tuberculosis.

3 series of guinea-pigs.

Calf 301.
Subcut.
Killed (very ill) 33 days.
General Tuberculosis.

Two calves of which Calf 321 (Subcut.) was one : G.T.	Rat 15. K. 167 days. G.T.

The virus from the prescapular gland of one of the calves was passed through three consecutive series of guinea-pigs and then inoculated into two calves, one subcutaneously, the other intraperitoneally.

The animal inoculated intraperitoneally was killed in 87 days and showed tuberculous peritonitis and tuberculosis of the thoracic and a few other glands and no disease of the organs. The other calf, No. 301, inoculated subcutaneously, was killed when very ill after 33 days, and showed severe general tuberculosis.

An emulsion made from the thoracic glands of Calf 301 gave rise in two calves (of which one was Calf 321), after subcutaneous inoculation, to severe general progressive tuberculosis, and to fatal tuberculosis in two rabbits. Cultures were isolated from the mediastinal gland of Calf 301, the prescapular gland of Calf 321, and from a rat, No. 15, which had been inoculated with the emulsion from Calf 301.

The culture from Calf 301 was eugonic and had irregular virulence ; inoculated, after fifteen months' artificial cultivation, into two calves, in a dose of 50 milligrammes, it produced in one slight general tuberculosis, the lesions in the lungs resembling those produced by a Group I bacillus, and in the other tuberculosis limited to the site of inoculation and the nearest gland ; in rabbits slight disease was produced in one animal and chronic general tuberculosis in two others.

The cultures from Calf 321 and Rat 15 were dysgonic and fully virulent.

RESULTS OF REINVESTIGATION.

The cultures from Calf 301 and Rat 15 were the only two which had been preserved.

The last subculture (24th generation) of the strain from Calf 301 was about three months old and subcultures from it on to serum failed ; in order to recover it a guinea-pig was inoculated and several tubes of the egg medium were sown at the same time ; the guinea-pig died of tuberculosis, but since growth had taken place on the egg tubes it was unnecessary to isolate a culture from this animal. The strain now grew readily on serum, and after three subcultures on this medium, its virulence was tested.

Virulence Tests.—The strain from Calf 301 was inoculated into a series of six rabbits, two intravenously, two intraperitoneally, and two subcutaneously ; the culture used was the 28th generation, the strain having been three years in artificial cultivation. One rabbit died after two days of causes other than tuberculosis. The remaining five died of general tuberculosis in from 12 to 52 days, the duration of life being a little longer than in rabbits inoculated with equivalent doses of bovine tubercle bacilli. Two cats inoculated at the same time as the rabbits died of acute tuberculosis.

The culture derived from Rat 15 was inoculated into a series of four rabbits (two intravenously and two intraperitoneally). The culture used was the 25th generation and the strain had been two years 7½ months in artificial cultivation. The rabbits inoculated intravenously (doses 1·0 and 0·1 mg.) died of general tuberculosis in 13 and 25 days, the intraperitoneal rabbits in 101 and 106 days ; the prolonged duration of life in the latter two was due to the injection being in one partly intracoecal and in the other partly subcutaneous and partly intracoecal.

Cultural Characters.—The culture from Calf 301 grew well on the differential media, the growths obtained closely resembling those produced by the human tubercle bacillus (Group II.). The strain from Rat 15 was dysgonic.

Summary.—The Calf 301 strain exhibited the cultural characters of a human tubercle bacillus, but resembled the bovine tubercle bacillus in its virulence. The Rat 15 strain was identical with a bovine tubercle bacillus.

VIRUS H 16. "J.H."

RECAPITULATION.

Tuberculous synovial membrane from knee joint.
|
Calf 157.
Subcut.
K. 67 days.
Local Tuberculosis.
|
Calf 187.
Subcut.
K. 81 days.
Local Tuberculosis.
|
Calf 273.
K. 89 days.
G.T. not severe.

Calf 337.
Subcut.
K. 80 days.
G.T. moderately severe.

Calf 355.
Subcut.
K. (dying) 43 days.
G.T.
|
Rabbit 66.
|
Bull 423A.
K. (very ill) 42 days.
G.T.
|
Culture.
|
Calf 559.
K. (dying) 39 days.
G.T.

The original material in this case was the tuberculous synovial membrane removed from the knee joint of an adult man ; the membrane was emulsified and inoculated subcutaneously into two calves. The calves were killed 54 and 67 days after respectively, and showed in each case a small local lesion and slight disease of the nearest gland, and in one case a calcareous focus in a bronchial gland.

An emulsion of the prescapular gland of one of the calves, No. 157, inoculated subcutaneously into another calf, No. 187, produced a small calcareous local lesion only.

An emulsion of this local lesion and the adjacent gland was made and inoculated subcutaneously into Calf 273 ; this calf was killed in 89 days and showed a local lesion, enlargement and caseation of the prescapular gland, many tuberculous nodules in the lungs, some tuberculosis of the liver and spleen, thoracic and hepatic glands, and one parotid lymphatic gland.

The prescapular gland of Calf 273 was emulsified and inoculated into two calves subcutaneously (Nos. 337 and 355) and one rabbit intraperitoneally. The rabbit died of general tuberculosis. One of the calves died of general tuberculosis in 43 days, the other was killed in 80 days and showed general progressive tuberculosis. With an emulsion made from the prescapular gland of Calf 355, four calves and two rabbits were inoculated. The two rabbits died of general tuberculosis and all the calves developed general progressive tuberculosis.

The virus from one of these rabbits (Rabbit 66) was inoculated into a bull (Bull 423A), which was killed when very ill 42 days later and showed general tuberculosis. The culture isolated from this bull was fully virulent.

Cultures isolated from Calf 157, from a guinea-pig inoculated with the original material, and from the prescapular gland of Calf 273 were eugonic and had low virulence for the calf and rabbit ; cultures from Calf 337 and Bull 423A and Calf 559 were dysgonic and virulent.

RESULTS OF REINVESTIGATION.

Three strains of the virus were alive, those from Calf 273, Bull 423A, and Calf 559.

Virulence Tests.—The culture derived from the prescapular gland of Calf 273 was retested after 2 years 11½ months' artificial cultivation ; the 36th generation of culture was used.

Six rabbits were inoculated, two intravenously, two intraperitoneally and two subcutaneously. All were killed when well 94 days later and showed slight tuberculosis of a chronic type.

The culture derived from the prepectoral gland of Bull 423A was tested on a series of five rabbits, two intravenously, two intraperitoneally, and one subcutaneously, after 2 years 6 months' artificial cultivation ; the 29th generation of culture was used. The two intravenous and the two intraperitoneal animals died of general tuberculosis in from 17 to 26 days ; the subcutaneous animal died of severe general tuberculosis in 126 days.

The culture derived from the hepatic gland of Calf 559 was tested after 2 years 1½ months' artificial cultivation ; the culture used was the 25th generation.

Five rabbits were inoculated, two intravenously, two intraperitoneally, and one subcutaneously. All the rabbits died of general tuberculosis.

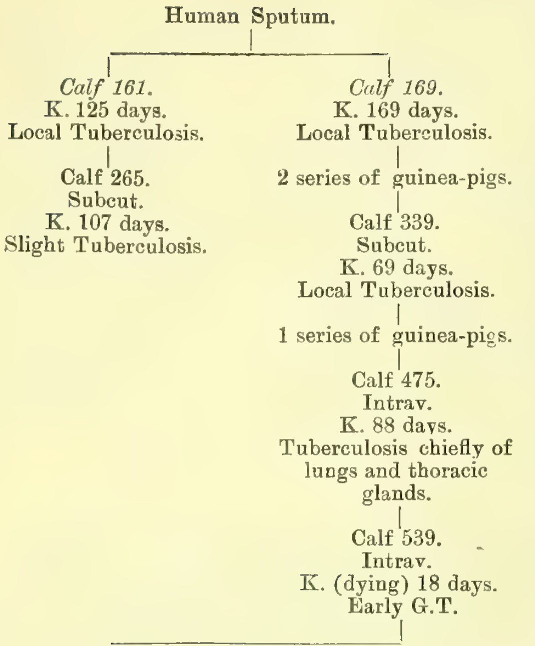
Cultural Characters.—The culture from Calf 273 was eugonic ; the cultures from Bull 423A and Calf 559 were dysgonic.

Summary.—The Calf 273 strain was identical with the human tubercle bacillus, the other two strains with the bovine tubercle bacillus.

VIRUS H 17. "Sp. B."

(*Mixed Sputum.*)

RECAPITULATION.



The virus was subsequently passed intravenously through four calves in succession, all of which died of acute tuberculosis. An emulsion of the tuberculous tissues from the second of these produced fatal general tuberculosis in two calves inoculated subcutaneously.

Four calves were fed, one for 91, the others for 120 days with the mixed sputum from many patients suffering from pulmonary tuberculosis; in each animal a retrogressive calcareous tuberculosis was found limited practically to the glands of the alimentary tract.

The tuberculous mesenteric glands of one of the calves, No. 161, were emulsified and inoculated into two calves subcutaneously; one of the calves killed after 114 days showed no sign of tuberculosis, the other (Calf 265) had slight retrogressive tuberculosis. A culture isolated from the latter calf, injected subcutaneously into two calves in 50 mg. doses, produced only slight tuberculosis. This passage did not proceed any further.

The virus from two of the other original calves was also passed each through a series of animals, one through calves, the other through guinea-pigs, a calf, and goats, without any change in virulence.

The tuberculous mesenteric glands from the fourth calf (Calf 169) were emulsified and inoculated into a series of guinea-pigs, and from this series the virus was passed through another series of guinea-pigs and then inoculated into a calf (Calf 339); this calf showed a local lesion and tuberculosis of the nearest glands only.

The virus after passage through another series of guinea-pigs was inoculated intravenously into Calf 475. This calf was killed in 88 days and showed progressing tuberculosis confined chiefly to the lungs and thoracic lymphatic glands. An emulsion of the lung was inoculated intravenously into Calf 539 which was killed when dying of general tuberculosis in 18 days. The virus from this calf was inoculated intraperitoneally into Rabbit 181 (which died in 22 days of general tuberculosis), and was passed through a series of four calves in succession.

Cultures isolated from Calves 265 and 339 were eugonic and slightly virulent. A culture from Rabbit 181 was eugonic and at first virulent; when it had been in cultivation 16 months it was found to be only slightly virulent. The cultures isolated from calves which died of general tuberculosis were dysgonic and virulent.

RESULTS OF REINVESTIGATION.

Only two strains of this virus were alive, the one derived from Calf 265, the other from Rabbit 181.

Virulence Tests.—The strain from Calf 265 was retested after it had been three years in artificial cultivation. Six rabbits were inoculated, two intravenously, two intraperitoneally, and two subcutaneously. All were killed after 97 days and showed slight chronic tuberculosis of the usual type.

The strain derived from Calf 539 through Rabbit 181 was tested when two years and two months old (27th generation). Six rabbits were inoculated, two intravenously, two intraperitoneally, and two subcutaneously. All were killed after 97 days and showed chronic tuberculosis of the type usual after the inoculation of a Group II bacillus.

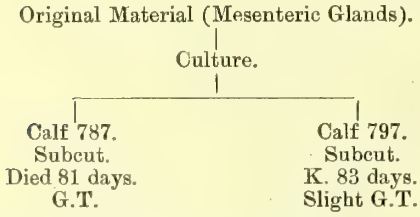
An earlier generation of this strain, *i.e.* the 11th, was also tested on rabbits; this culture had been preserved in a cupboard and was 253 days old, too old to obtain a culture direct from it; it was therefore inoculated into a guinea-pig and a culture was raised from the latter's tuberculous organs; the strain when 7½ weeks old was inoculated into a series of rabbits none of which developed progressive tuberculosis.

Cultural Characters.—The strain from Calf 265 and the two strains from Rabbit 181 grew luxuriantly on the differential media.

Summary.—The strains from Calf 265 and Rabbit 181 exhibited the cultural characters and virulence of the human tubercle bacillus.

VIRUS H 49. "T.C."

RECAPITULATION.



This virus was obtained from a youth aged 18 who died of tuberculosis of the lungs; several of the mesenteric glands were calcareous and as hard as a stone. A culture was obtained directly from the mesenteric glands; the attempt to obtain a culture from the lung failed.

The culture when two months old was inoculated subcutaneously into two calves in doses of 50 mg. each and intraperitoneally into rabbits; it gave rise in one of the calves (Calf 787) to fatal generalised progressive tuberculosis and in the other (Calf 797) to a limited retrogressive tuberculosis; it gave rise in the rabbits to fatal general tuberculosis.

A culture obtained from the prescapular gland of Calf 797 (in which the original culture had produced only a limited retrogressive tuberculosis) when two months old produced fatal tuberculosis in two calves in a dose of 50 mg. and also in a dose of 10 mg.; it was fully virulent also for rabbits.

When nine months old, the original culture (7th subculture) failed to produce progressive tuberculosis in rabbits, and when 14 months old (14th subculture) produced in a calf in a dose of 50 mg. only a very limited retrogressive tuberculosis and in rabbits slight non-progressive tuberculosis.

The original culture, therefore, when tested soon after its isolation, exhibited a virulence somewhat below that of Group I.; this virulence was increased by passage through the body of the calf to the level of a bovine tubercle bacillus and diminished by subculture on serum to the level of a human tubercle bacillus.

The original culture was, according to Dr. Cobbett, eugonic, and was placed by Dr. Eastwood in his Grade II.

RESULTS OF REINVESTIGATION.

Four strains of the virus were in existence, two from the original material which had been separately subcultivated, and those from Calves 787 and 797. All four strains were tested on rabbits and two on calves.

Virulence Tests.—The culture derived from the original material which had been cultivated by Cobbett in the Blythwood laboratory was tested after 20½ months' cultivation (21st generation). Six rabbits were inoculated, two intravenously, two intraperitoneally, and two subcutaneously. One died of pseudo-tuberculosis in 11 days; the others were all killed after 130 days and showed slight tuberculosis of a chronic type. Later on a culture of the 25th generation was inoculated subcutaneously into two calves (Calf 1191 and Calf 1193) and two rabbits (doses 50 and 100 mg.); the calves after 94 and 99 days had only slight retrogressive tuberculosis, and each of the rabbits after 142 days had a local lesion only.

The culture from the original material had been given shortly after its isolation to Dr. Eastwood, and had been subcultivated regularly on serum ever since at the Royalcot laboratory; in order to ascertain whether this strain had also lost its virulence, I obtained a culture from him and inoculated it into a series of three rabbits; the culture had then been 22½ months in cultivation and was the 25th generation. Two of the rabbits were inoculated intravenously and one intraperitoneally; the former died of general tuberculosis in 16 and 31 days respectively; the latter was killed after 163 days and showed chronic general tuberculosis, the injection having been partly intracoecal; the type of disease produced in the three cases was identical with that produced by a bovine tubercle bacillus.

The culture derived from Calf 787 was tested after 16 months' artificial cultivation. Six rabbits were inoculated, two intravenously, two intraperitoneally, and two subcutaneously. All died of general tuberculosis in from 14 to 90 days.

The culture derived from Calf 797 was also tested after 16 months' artificial cultivation. Six rabbits were inoculated, two intravenously, two intraperitoneally, and two subcutaneously. One intraperitoneal animal died in 12 days of acute tuberculosis, complicated with severe psorospermosis of the liver; the others all died of general tuberculosis in from 13 to 80 days.

Cultural Characters.—The Blythwood strain of the original culture and a strain from each of the two calves inoculated with it (Nos. 1191 and 1193) grew well on glycerin media, as did also the Royalcot strain.

The two strains from Calf 787 and 797 did not grow so well as the strains from the original material, and resembled the more easy growing strains of bovine origin.

Summary.—The Blythwood strain of the original culture exhibited the cultural characters and virulence of a human tubercle bacillus: the Royalcot strain had the cultural characters of a human tubercle bacillus but resembled a bovine tubercle bacillus in virulence; the strains derived from Calves 787 and 797 were identical with bovine tubercle bacilli.

SUMMARY OF PRELIMINARY EXPERIMENTS.

Ten strains from the four viruses (H 13."A.D.", H 16."J.H.", H 17."Sp.B.", and H 49." T.C."), which during passage through the animal body underwent a change of character have been retested as to their cultural characters and virulence for rabbits.

Two strains from the virus designated H 2."Sp. A.", the original material of which was mixed sputum have also been retested [this virus was passed through a series of animals, and from some a slightly virulent, from others a virulent culture was isolated].

With two exceptions the cultural characters and the virulence of the twelve strains were found strictly in accordance; those strains which grew well on culture media had low virulence for rabbits, those which grew with difficulty were highly virulent for rabbits. The preliminary tests therefore gave no indication of the presence in any of these ten strains of two different kinds of organisms, and no further investigations with them were carried out. Whatever they had been they were now stable.

The first exception was the culture isolated from the mediastinal gland of Calf 301 (Virus H 13."A.D."), an animal which died of general tuberculosis after the subcutaneous inoculation (in passage) of an emulsion from the tuberculous organs of guinea-pigs; the culture was eugonic, and when tested by Dr. Cobbett after 15 months artificial cultivation produced in two rabbits slight chronic general tuberculosis, and in two calves inoculated with 50 milligrammes subcutaneously limited tuberculosis in one, and slight general tuberculosis in the other. When retested by me after a period of three years' artificial cultivation it grew luxuriantly on glycerin media, and produced in two calves generalised tuberculosis, not severe and not apparently progressive, and fatal general progressive tuberculosis in rabbits. It was more virulent therefore than when tested by Dr. Cobbett, but less virulent than a bovine tubercle bacillus.

The second exception was the culture derived directly from the mesenteric glands of a youth aged 18 (Virus H 49." T.C."). This culture had been cultivated in two different laboratories, in the Blythwood laboratory in charge of Dr. Cobbett and, since an early generation, in the Royalcot laboratory in charge of Dr. Eastwood. The former, called the Blythwood strain, had been tested by Dr. Cobbett two and seven months after isolation, and produced in calves and rabbits fatal general progressive tuberculosis; it was again tested 13½ months after its isolation and was found to have lost its virulence. The latter, or Royalcot strain, was tested by me when it had been in cultivation about two years, and was found to be virulent for the calf and rabbit, though not so virulent as a bovine tubercle bacillus. Both of the strains grew luxuriantly on artificial media, and were in this respect identical.

With these two exceptional strains further experiments were made (vide infra).

RESULTS OF THE SPECIAL INVESTIGATION OF TWO OF THE GROUP III. CULTURES [*H 13. "A.D." (CALF 301), AND H 49. "T.C." (O.M.)*] WHICH EXHIBITED EXCEPTIONAL FEATURES.

SEPARATION EXPERIMENTS.

INTRODUCTION.

The preliminary experiments with various strains of the viruses which had been placed in Group III. showed that two, *i.e.*, the Calf 301 strain of Virus H 13. "A.D." and the strain from the original material of Virus H 49. "T.C.", though they grew like the slightly virulent human tubercle bacillus, were nevertheless able to set up in rabbits generalised progressive tuberculosis. They behaved in fact like artificial mixtures of human and bovine tubercle bacilli.

For purposes of further investigation therefore they were assumed to be mixtures of this nature and attempts were made in each case to separate the component elements.

In an artificial mixture of human and bovine tubercle bacilli a separation of the two kinds of bacilli may be effected in three ways.

1. By passing the culture through the bodies of animals (*e.g.* calves and rabbits) which permit the multiplication of one kind of bacillus and resist that of the other.
2. By subculture on media containing a substance (glycerin) which is more favourable to the growth of one kind of bacillus than it is to that of the other.
3. By a method of plate culture.

All the three methods have been employed in the case of each strain.

The first method depends for its success on the fact that the bovine tubercle bacillus is able when inoculated subcutaneously to set up progressive tuberculosis in the calf and rabbit whereas the human tubercle bacillus (Group II.) is not so able.

In these animals after subcutaneous inoculation there is with both kinds of bacilli an initial dispersal all over the body but the human tubercle bacillus tends gradually to disappear while the bovine tubercle bacillus multiplies and gives rise to definite tuberculous lesions.

The human tubercle bacillus remains alive however in the tissues of the calf and rabbit for a long time and may conceivably be present within lesions produced by the bovine tubercle bacillus.

One passage through the animal body may not therefore be sufficient to eliminate entirely the possibility of cultivating the human tubercle bacillus along with the bovine unless the duration of life of the animal be long and the dose of slightly virulent bacilli be small.

The rabbit is more susceptible than the calf to the human tubercle bacillus and after subcutaneous inoculation of even moderate doses there may be a considerable number of tuberculous lesions in the lungs and kidneys, and since the lungs and kidneys are often the only organs affected in rabbits inoculated subcutaneously with bovine tubercle bacilli, elimination of the human tubercle bacillus in a mixture would be expected to be less certain in the rabbit than in the calf; and this experiment has shown to be the case. In the calf there is a greater range of lesions to choose from and the cultures can be raised from regions which only rarely show naked eye evidence of the presence of the human tubercle bacillus; it has been shown in several instances in this investigation that if glands (*e.g.*, the mediastinal and portal) are chosen which frequently show lesions after the subcutaneous inoculation of human bacilli (Group II.) there exists the possibility of obtaining in a culture both kinds of bacilli together. Since one passage, either through the body of the calf or the rabbit could not be relied upon absolutely to eliminate the human tubercle bacillus the culture was in the majority of cases passed through more than one animal; in the case of the calves cultures were always isolated from distal lesions as well as the nearest gland.

While the method just described eliminates the eugonic element in a mixture, the second method—cultivation on glycerin media—is applied to eliminate the virulent element.

On glycerin media bovine tubercle bacilli grow, as a general rule, less well than the human tubercle bacillus, and in a culture containing both human and bovine tubercle bacilli would after several generations be expected to be finally overgrown. Many bovine tubercle bacilli, however, grow well on glycerin media, and all, even the most dysgonic, grow more luxuriantly when repeatedly subcultured on glycerin media.

The method would therefore fail to eliminate the bovine tubercle bacillus if the latter were well adapted from the outset to grow on glycerin media. It might be at once successful, *i.e.*, after one subculture, if the bacillus grew very badly ; there is a certain class of bovine tubercle bacilli which begin to grow on glycerin serum apparently only during the second or third weeks, when they produce discrete colonies ; the portion of culture selected for the second glycerin subculture might within this period very easily not contain any of these colonies, and the strain would then be found to have lost its virulence ; but if the culture transplanted on to the second glycerin serum tube included any of the colonies, the bacilli which gave rise to them would tend not gradually to disappear but to be perpetuated, since the most dysgonic tubercle bacilli are improved in their growth capacity after one subculture on a glycerinated medium.

Subculture on glycerin media may be successful therefore, but cannot be relied upon in every case to eliminate the bovine bacillus in a mixture of human and bovine tubercle bacilli.

Dr. Cobbett used the method extensively, and was successful in eliminating the virulent element from an artificial mixture and from a natural mixture ; in both of his cases the virulent bacillus was a dysgonic bacillus.

Though the invariable replacement of a eugonic virulent strain by a dysgonic virulent strain by passage through the bodies of calves and rabbits, and though the complete loss or diminution of the virulence of the culture by growth on glycerin media would point strongly to the presence originally of two different kinds of bacilli, the only conclusive evidence of mixture would be furnished by the actual isolation from the culture, by means of plate culture, of strains with different and distinctive properties.

On account of the tendency of tubercle bacilli to adhere together in masses, and the impossibility of obtaining a homogeneous suspension, the application of the ordinary plate methods to a culture is only very rarely likely to be attended with success.

In a carefully prepared suspension of a culture there may be many single bacilli which may give rise to colonies, and these the investigator may be fortunate enough to select for investigation. But to determine whether or no a culture of tubercle bacilli is composed of one kind of bacillus involves a considerable amount of work —the culture must be tested, not only as to its characters on artificial media, but also as to its virulence for rabbits ; naked eye characters alone of colonies are not sufficient to differentiate between the bovine and human bacilli ; if a glycerin medium were used for the separation experiments, a small non-pigmented colony might probably be shown to be composed of virulent bacilli only, but it would be impossible, as the necessity for the present investigation shows, to say from cultural characters alone whether a culture which grows readily had not an admixture of dysgonic bacilli.

It was very important, therefore, in order to avoid unnecessary labour, that the bacilli in the material used for sowing the plates should be as isolated as possible. In emulsions of the tuberculous lesions of the guinea-pig, the isolation of individual bacilli, though not absolute, is very much greater than could possibly be secured by any method of emulsification of a culture.

In each case, therefore, the culture was inoculated into a guinea-pig, and the plates were sown with an emulsion made from its tuberculous tissues.

The guinea-pig is a most suitable animal for the purpose since it is almost equally susceptible both to the human and to the bovine tubercle bacillus, and the relative proportion of the two kinds of bacilli is not therefore likely to be seriously altered by the passage.

The medium used for the plates was bovine serum with the addition of 5 per cent. glycerin ; the glycerin was added in order to assist in the differentiation of the colonies, for on glycerinated serum the human tubercle bacillus grows generally with greater ease than the bovine bacillus, and often forms pigmented colonies.

The Petri dishes were filled to a depth of about 2 mm., and the serum was coagulated in the usual way ; after sowing, the plates were sealed with paraffin.

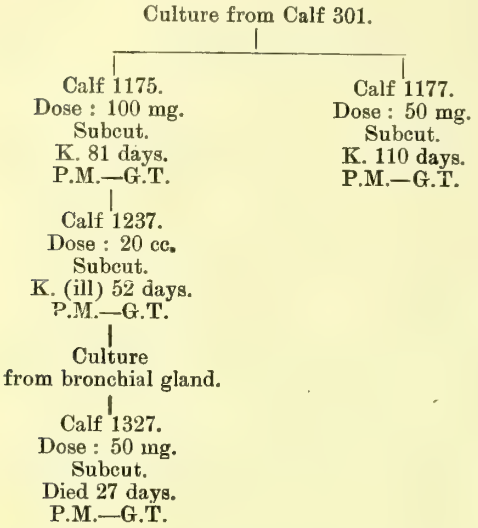
The method of separation was by surface cultivation, and plates were used merely for convenience and to secure as large a surface as possible ; large test-tubes containing glycerin serum were always sown at the same time as the plates, and in some instances colonies from these tubes were removed for investigation. The emulsion was diluted to an extent sufficient to secure isolated colonies, and spread thinly over the surface of the plates by means of a sterile camel's hair brush. It was found to be possible, however, to pour plates in the usual way. This was done in one case, but only one of the colonies produced was investigated : the medium used in this instance was agar with the addition of 10 per cent. serum ; the agar was melted and then cooled to 45° C. ; the serum and a loopful of the emulsion was then added, and the mixture poured into the plates.

VIRUS H 13. "A.D." (Calf 301 strain.)

SEPARATION BY ANIMAL INOCULATION.

(*See* Tables A and B.)

Calves.—Two calves were inoculated subcutaneously on March 23, 1907; one, No. 1177, with 50 milligrammes, the other, No. 1175, with 100 milligrammes of the culture derived from the mediastinal gland of Calf 301; the culture had then been three years two months in artificial cultivation and had been maintained during this period on pure serum with the exception of one generation which was grown on egg.



Both calves remained well and were killed in good health 81 and 110 days later respectively; they showed at the post-mortem examination generalised tuberculosis, not severe and not apparently progressive.

An emulsion of the caseous prescapular gland of Calf 1175 was prepared and 20 cubic centimetres inoculated subcutaneously into Calf 1237. The calf was killed when ill after 52 days and showed severe general tuberculosis.

Rabbits were inoculated subcutaneously with emulsions of tuberculous tissues from each of the first two calves, the prescapular, a mediastinal, and a popliteal gland in one case, the prescapular gland and the spleen in the other; all died of general tuberculosis in periods varying from 47 to 167 days.

Cultures were isolated from each of the three calves (1175, 1177, and 1237), from the prescapular gland as well as from metastatic lesions and from several of the rabbits; altogether eight strains from calves were investigated in culture and two from rabbits.

With one exception all the strains grew badly on artificial media; on glycerin serum growth was rather better than on serum alone, on glycerin agar a patchy grey layer was formed in which discrete colonies subsequently developed, on potato growth was thin grey and uniform, and on broth thin incomplete and broken up into islands. The exceptional strain was obtained from one of the mediastinal glands of Calf 1175; this behaved like the original strain, growing well on artificial media and producing fatal general tuberculosis in rabbits; for the further investigation of this strain see under "Separation by Plate Cultures."

The strain derived by culture from the bronchial gland of Calf 1237, the second calf of the series, was inoculated subcutaneously in a dose of 50 milligrammes into Calf 1327 and in doses of 10 mg. into each of two rabbits; the calf died of miliary tuberculosis in 27 days and the rabbits of general tuberculosis in 37 and 68 days. This strain was identical with a bovine tubercle bacillus therefore both with respect to its cultural characters and its virulence.

Rabbits.—As has already been mentioned, a preliminary series of rabbits was inoculated with the Calf 301 strain to ascertain its virulence. All these animals died of general tuberculosis, and from two of them cultures were isolated; one of the rabbits, No. 1137, had been inoculated intravenously and the culture was obtained from the spleen; the other, No. 1140, had been inoculated subcutaneously and the culture was obtained from the lung. In each case the culture grew irregularly; on most of the tubes sown scanty growths were obtained, but, occasionally, more especially on potato, the growths were very good; the cultures behaved as if they were composed of poorly growing bacilli with a slight admixture of easy growing bacilli. Each culture when it had been in cultivation in one case 212 days, in the other 188 days, was inoculated subcutaneously into a rabbit. Both died of general tuberculosis, one in 62, the other in 29 days. The cultures isolated from these animals grew badly on all media and resembled precisely the poorly growing strains obtained from the calves.

Two rabbits were inoculated subcutaneously with the original culture at the same time as Calves 1175 and 1177, one with 50 mg., the other with 10 mg.; the former died in 28 days of general tuberculosis; the latter was killed when ill after 107 days and showed chronic general tuberculosis. A culture isolated from the latter animal was dysgonic and resembled the poorly growing strains isolated from the calves.

The result therefore was the same, whether the culture was passed through the body of the calf or of the rabbit, the eugonic element was eliminated and there was obtained a dysgonic fully virulent bacillus.

SEPARATION BY GLYCERIN MEDIA.

(*See* Table C.)

The original culture was subcultivated on glycerin serum for two generations, and then inoculated subcutaneously into a calf in a dose of 100 mg. and two rabbits in doses of 50 and 10 mg. Both rabbits died of general tuberculosis in 103 and 100 days respectively. The calf was killed after 92 days, and showed general tuberculosis very similar in extent and distribution to that produced in the two calves inoculated with serum culture. Four rabbits were inoculated with tuberculous tissues from this calf, two from the prescapular gland, and two from a mediastinal gland; one of each pair died prematurely; the other two died of general tuberculosis in 92 and 53 days respectively.

Cultures were isolated from the prescapular gland and a mediastinal gland of the calf and from a rabbit inoculated with the prescapular gland. All the strains grew poorly on glycerin media in spite of the fact that they had resided for two generations on glycerin serum.

Subculture on glycerin serum therefore failed to eliminate the virulent element from the culture; the virulence was nevertheless reduced, as shown by the long duration of life of the two rabbits inoculated subcutaneously.

SEPARATION BY PLATE CULTURES.

(*See* Tables D, E, and F.)

To furnish material for sowing the plates, a guinea-pig, No. 2491, was inoculated intraperitoneally with an emulsion of a large colony from an egg tube sown with the Calf 301 strain; the colony was 205 days old. The guinea-pig was killed 25 days later and found to have early general tuberculosis; an emulsion was made from a caseous sternal gland, and spread over the surface of glycerin serum plates with a camel's hair brush.

After several weeks incubation the plates were removed from the incubator and examined; they were found to be covered with growth which in the main consisted of two quite distinct kinds of colonies; one kind was small and grey and not pigmented, the other was large yellow and wrinkled, spreading in some cases up the sides of the plate.

Eight of the large colonies and two of the small ones were separately subcultivated on glycerin serum. These strains after subculture were tested on rabbits and on the differential media.

The strains raised from the two small colonies (Colonies 4 & 5) were highly virulent for rabbits, and grew poorly on the differential media; one (Colony 5) was inoculated subcutaneously in a dose of 50 mg. into a calf (1309) which died of acute tuberculosis in 30 days. Both these strains therefore were identical with a bovine tubercle bacillus.

The strains from the large colonies grew more luxuriantly than those from the small colonies on all the media used; on serum they produced a yellow pigment, on potato and agar some of the strains grew very abundantly, others only moderately well. Each of the strains was tested on rabbits subcutaneously; the doses were not estimated, but were in every case very large, consisting of the whole or half of the growth on a large glycerin serum tube.

Three of the rabbits, Nos. 1516, 1519, and 1521, inoculated respectively with culture from Colonies 3, 6, and 8, had when killed 160 days later besides a local lesion only slight tuberculosis of the lungs and one or two tubercles in the kidneys. The amount and extent of the disease in these animals were not greater than might have been produced by a Group II. bacillus, but on the other hand they were not less than might have been produced by a small dose of a Group I. bacillus.

In order, therefore, to ascertain whether the particular strains used for these rabbits were composed of one kind of organism only, it was necessary to isolate and test cultures from metastatic lesions. A culture was accordingly raised from the lung of each of the three rabbits (1516, 1519, and 1521). These cultures grew well on the differential media, and were inoculated intravenously into two rabbits in doses of 0·1 and 0·01 mg.

The results showed that in the cultures inoculated there were no bacilli capable of giving rise to progressive tuberculosis in the rabbit.

The three colonies were composed solely therefore of eugonic slightly virulent bacilli.

The other five strains (from Colonies 1, 2, 7, 9, and 10) each produced in the rabbit progressive tuberculosis and from the lesions in two of the rabbits dysgonic bacilli were isolated.

Two of the colonies (Colonies 2 and 9) were retested, the former on a calf (Calf 1301) and two rabbits, the latter on a series of three rabbits. The animals in each series died of general tuberculosis, and from the portal gland of the calf (Colony 2 strain) and from one of the rabbits inoculated with Colony 9 strain, dysgonic cultures were isolated.

These five strains resembled therefore the original culture.

In the event that the experiments with the strains from Guinea-pig 2491 were not successful in separating the virulent from the eugonic element, an emulsion made from one of the large colonies (Colony 11) on a plate sown from Guinea-pig 2491 was inoculated intraperitoneally into Guinea-pig 2605 and plate cultures were sown with emulsions made from the omentum and spleen; a rabbit inoculated subcutaneously at the same time as the guinea-pig died of general tuberculosis. A culture was raised on egg in the ordinary way from the omentum and spleen of the guinea-pig; these strains grew luxuriantly on artificial media and produced general tuberculosis in a series of two and four rabbits; the duration of life was however longer than in rabbits inoculated with equivalent doses of a bovine tubercle bacillus.

Numerous colonies appeared on all the plates but on one, sown from the omentum, they were sufficiently discrete to enable one to pick off separate colonies. The colonies were of two kinds; some were small, flat, and of a greyish colour, the others were a little larger, more raised, and of a canary yellow colour.

Eleven colonies, four grey and seven yellow, were selected and separately subcultivated. On glycerin potato three of the strains from grey colonies grew poorly, the fourth grew well; all the strains from yellow colonies produced thick wrinkled pigmented growths.

One of the strains from a grey colony (Colony 4) and five from yellow colonies (Colonies 6, 7, 8, 9, and 10) were inoculated each into two rabbits intravenously.

The two rabbits inoculated with the Colony 4 strain died of miliary tuberculosis in 18 and 28 days; this strain was therefore dysgonic and fully virulent.

Two of the strains, raised from the yellow Colonies 8 and 10, produced progressive tuberculosis in rabbits; they resembled therefore the original culture.

The three remaining strains from the yellow Colonies 6, 7, and 9 were inoculated each into two rabbits; one died in 69 days and showed slight tuberculosis of the lungs and kidneys; the other five remained well and when killed in from 104 to 119 days showed the type of tuberculosis commonly met with after the intravenous inoculation of slightly virulent human tubercle bacilli. Two of these strains, from Colonies 6 and 7, were each inoculated subcutaneously into a calf, one in a dose of 59 mg., the other in a dose of 78 mg.; they were killed 76 and 84 days later respectively and each showed a local lesion and tuberculosis of the nearest glands only (in one of the calves there was a doubtful focus in a bronchial gland and a doubtful tubercle in the lung).

The emulsion from the omentum of Guinea-pig 2605 was also plated in the way ordinarily used for separating the commoner organisms. The medium used was agar, to which had been added 10 per cent. serum. Sparsely scattered colonies were obtained on all the plates, some growing on the surface, some in the depth; one of the surface colonies was removed and separately cultivated; the culture grew luxuriantly on glycerin media; three rabbits (Nos. 1777–1779) were inoculated with it, two intravenously and one subcutaneously. The results showed that the culture was composed of the slightly virulent type of bacillus only.

The investigation of the strains from Guinea-pig 2605 has shown therefore that of the seven tested in culture and by inoculation one was dysgonic and virulent and resembled a bovine tubercle bacillus, four were eugonic and slightly virulent and resembled a human Group II bacillus, and two were eugonic and virulent and were like the original culture.

The culture isolated from the mediastinal gland of Calf 1175 closely resembled the original culture—it grew well on glycerin media and was virulent for rabbits—and an attempt was made by means of plate cultures to separate a eugonic slightly virulent bacillus and a dysgonic virulent bacillus.

A guinea-pig (No. 2621) was inoculated with a 70 days' old glycerin serum culture and large tubes of glycerin serum were sown from its tuberculous spleen and sternal gland. On these tubes two kinds of colonies could be distinguished, grey and yellow. Four of the yellow colonies and two of the grey were taken and separately subcultivated.

After several subcultures on serum the four strains from yellow colonies (Colonies 1, 2, 3, and 4) were inoculated into rabbits, the two former intravenously each into two rabbits and the two latter subcutaneously each into one rabbit. The first two colonies produced progressive tuberculosis in rabbits; the two rabbits inoculated with the other two colonies died prematurely in 56 and 41 days and showed slight tuberculosis.

The two strains from grey colonies (Colonies 5 and 6) inoculated each into a rabbit subcutaneously, produced fatal general tuberculosis identical with that produced by a bovine tubercle bacillus.

The culture raised in the ordinary way from the spleen of Guinea-pig 2621 was eugonic and virulent.

From each of three different strains of the Calf 301 culture therefore, cultures raised from separate colonies have been obtained which are identical some with a bovine tubercle bacillus, others with a human tubercle bacillus.

VIRUS H 49. "T.C." (Strain from the original material.)

SEPARATION BY ANIMAL INOCULATION.

(*See* Tables G, H, and I.)

Culture from O.M.
(Royalcot strain.)
|
Calf 1213.
Subcut.
50 mg.
K. 80 days.
Chronic G.T.
|
Calf 1263.
Subcut.
E. of Prescap. Gland.
K. 91 days.
Chronic G.T.
|
Culture from thoracic gland.
|
Calf 1347.
Subcut.
50 mg.
K. (ill) 52 days.
Severe G.T.

Calves.—Calf 1213 was inoculated subcutaneously with 50 mg. of the original culture ; the strain had then been 746 days in artificial cultivation, and had been maintained during this time on serum alone ; a series of four rabbits was inoculated at the same time as the calf. The calf was killed in good health 80 days after inoculation, and showed general progressive tuberculosis of a chronic type. All the rabbits developed fatal general tuberculosis, but the duration of life was prolonged as compared with that of rabbits inoculated with bovine tubercle bacilli.

An emulsion was prepared from the enlarged caseous prescapular gland of Calf 1213, and inoculated subcutaneously into Calf 1263 ; two rabbits were also inoculated subcutaneously with the prescapular gland emulsion, and two with an emulsion made from a mediastinal gland.

The calf was killed in good health 91 days after inoculation, and showed chronic general tuberculosis, the lungs being covered with "perlsucht" growths ; all the rabbits developed generalised progressive tuberculosis.

Two rabbits were inoculated subcutaneously with tuberculous tissues from Calf 1263, one with an emulsion of the prescapular gland, the other with an emulsion from a portal gland ; the latter died prematurely, the former was killed after 232 days and showed chronic progressive tuberculosis.

Cultures were isolated from each of the two calves, 1213 and 1263, from the prescapular gland as well as from distal lesions.

The strain from the mediastinal gland of Calf 1213 grew luxuriantly on broth, and moderately well on the other media. The other strains from this calf, as well as all those from Calf 1263 grew much less well than the original strain, and were indistinguishable from a bovine tubercle bacillus.

The culture derived from the mediastinal gland of Calf 1263 was tested subcutaneously on a calf in a dose of 50 mg., and on two rabbits in doses of 10 and 7·3 mg.

The calf (1347) was killed when ill 52 days after inoculation and showed generalised progressive tuberculosis ; the rabbits died in 74 and 78 days respectively of general tuberculosis.

The culture obtained from the prescapular gland of Calf 1213 was also tested on rabbits ; twelve colonies were taken from an egg tube and separately cultivated for three generations ; the growth from one serum tube in the case of each strain was then inoculated subcutaneously into a rabbit ; nine of the rabbits died in from 23 to 91 days of general tuberculosis, the other three were killed after 108 days, and all showed generalised progressive tuberculosis.

Rabbits.—Cultures were isolated from two of the three rabbits inoculated to test the virulence of the original strain. One of the rabbits, No. 1181, died 31 days after an intravenous inoculation of 0·1 mg., and cultures were obtained from the lung and a kidney ; the other rabbit (No. 1182) had been inoculated intraperitoneally with 1·0 mg. of culture, and died of general tuberculosis in 106 days, the long duration of life being due to the fact that the injection was partly subcutaneous ; the culture in this case was taken from a pleural nodule.

The culture from the latter rabbit was dysgonic and resembled the strains from the calves.

The cultures from the other rabbit (Rabbit 1181) were irregular in their growth ; on potato for example very good growths were occasionally obtained, while on other media the growths were usually poor.

An emulsion of the lung of Rabbit 1181 was inoculated subcutaneously into two rabbits ; both animals died of general tuberculosis, one in 74, the other in 82 days. A culture isolated from the scapular gland of one of the rabbits, No. 1219, was dysgonic and resembled the strains from the calves.

By passage through the body of the calf, as well as through that of the rabbit therefore the eugonic element in the culture has been eliminated, and a dysgonic virulent culture obtained.

SEPARATION BY GLYCERIN MEDIA.

(*See* Table J.)

A separation of the virulent element from the easy growing element by means of glycerin was effected unwittingly. A good growth had been obtained on a tube of glycerin agar and with the object of securing a preponderance of easy growing bacilli in the material for sowing plates this culture was used to inoculate a guinea-pig, No. 2490.

The guinea-pig developed tuberculosis and plates of glycerin serum were sown with an emulsion made from the caseous sternal gland.

Colonies were obtained sufficiently discrete and subcultures were made from twelve ; the colonies varied in size but not in type and a selection was made of large and small.

After two subcultures on serum the strains were tested on glycerin potato ; the growths produced on some of the potatoes were very good, on others poor. This preliminary test seemed to indicate that a separation of a dysgonic and a eugonic bacillus had been effected. Six of the strains, representing both easy growing and poorly growing strains were therefore tested on rabbits, one rabbit being inoculated subcutaneously with one serum culture of each strain. All the rabbits remained well and when killed in periods varying from 94 to 99 days showed slight and retrogressive tuberculosis only ; in each rabbit there were some miliary tubercles in the lungs and in two very slight tuberculosis of the kidneys. Cultures were isolated from each one of these animals, four being isolated from lungs, three from local lesions and one from a scapular gland. All the strains were eugonic. The scapular gland culture was tested on two rabbits intravenously and found to be only slightly virulent.

Subsequently four more of the twelve strains were tested on rabbits, two intravenously and two subcutaneously, and three of the six that had been inoculated subcutaneously were retested intravenously, each on two rabbits. The results in all these rabbits showed that the strains had only slight virulence.

Strain 9 was also inoculated into a guinea-pig (No. 2816) and cultures were obtained from the spleen and sternal gland. Both strains grew well and the spleen strain had only slight virulence for the rabbit.

When it was realised that all the colonies isolated from Guinea-pig 2490 were of one type and only slightly virulent for the rabbit the culture obtained from the guinea-pig in the ordinary way *i.e.* by scraping the surface of an egg tube, and arising therefore from a number of colonies, was inoculated into a series of four rabbits, three intravenously and one subcutaneously. None of the rabbits developed fatal tuberculosis, the disease produced in all being consistent with the inoculation of a Group II. bacillus.

It is clear from these experiments that there were no virulent bacilli in the culture inoculated into the guinea-pig and that subculture on a medium containing glycerin had resulted in the elimination of the virulent element from the virulent eugonic culture.

The experiments show further that size of colony alone cannot be relied upon as a means of differentiating two kinds of organisms

SEPARATION BY PLATE CULTURES.

(*See* Tables J and K.)

As has already been described the first attempt to separate different types of bacilli from the culture by means of plate cultures was unsuccessful ; it had failed because cultivation on a glycerin medium had caused the elimination of the virulent element.

In a second experiment I started with a culture which had not been subjected to the influence of glycerin.

The culture in its 35th generation (2 years, 11 months old) was inoculated intraperitoneally into Guinea-pig 2918, and a generation later was tested on a series of four rabbits (*see* Table G) in order to see whether the original culture maintained on serum had retained its virulence ; all the rabbits died of general tuberculosis, the duration of life being a little prolonged as compared with that after the inoculation of bovine tubercle bacilli.

The guinea-pig died in 14 days of tuberculosis, and emulsions were made from the sternal gland and spleen. Four glycerin serum plates were sown with the emulsions as well as a number of egg tubes and large glycerin serum tubes.

Numerous colonies grew on the tubes while on the plates the colonies were very sparsely scattered ; they varied in size but did not differ in any other respect.

A subculture made in the ordinary way from an egg tube produced luxuriant growths on the glycerin media.

Eighteen colonies, twelve from the plates and six from the glycerin serum tubes, were taken and separately subcultivated on serum ; after four subcultures all the strains were tested on glycerin potato in order to gain a preliminary impression as to the properties of the strains.

Five of the strains grew very well, producing yellow wrinkled or warty layers ; of the rest, some grew very poorly, while the others produced intermediate amounts of growth.

Four of the eugonic and one of the dysgonic strains were selected for inoculation into animals.

Each strain was inoculated intravenously into a series of three rabbits.

Two of the eugonic strains (from Colonies 5 and 7) produced slight retrogressive tuberculosis in rabbits. Fifty milligrammes of culture from Colony 7 produced in a calf (Calf 1415) inoculated subcutaneously local tuberculosis only. These two strains therefore contained no virulent bacilli.

The other two eugonic strains (from Colonies 3 and 13) produced fatal general tuberculosis in all the rabbits inoculated, and one of them (from Colony 3) gave rise in a calf (Calf 1387) inoculated subcutaneously with 50 mg. to general tuberculosis fatal in 58 days. These two strains exhibited therefore the properties of the original culture.

The dysgonic strain (from Colony 17) produced rapidly fatal general tuberculosis in all the rabbits inoculated. It was also inoculated subcutaneously into two calves in doses of 50 mg. (Calf 1413) and 48 mg. (Calf 1501). The former was killed after 107 days and showed slight retrogressive general tuberculosis, the latter died in 45 days of general tuberculosis.

Thus by the use of the plate method of separation strains of tubercle bacilli with the properties of the human and of the bovine tubercle bacillus respectively have been isolated from the H 49. " T.C." culture.

SUMMARY AND CONCLUSION.

The second part of this report is concerned with two cultures—H 13. " A.D." Calf 301 strain, and H 49. " T.C.," strain from the original material (mesenteric gland)—which had been shown to possess in common the capacity to grow luxuriantly on artificial media and to produce general progressive tuberculosis in calves and rabbits.

Each of the cultures has been specially investigated with the object of ascertaining whether the want of that accordance which usually obtains between cultural characters and virulence was due to a mixture of bacilli, with the properties of the human and the bovine tubercle bacillus respectively.

To each culture, three methods of separation have been applied, viz. :—(1.) Animal inoculation : (2.) Cultivation on glycerin media : (3.) Plate cultivation.—With the following results :—

By passage through the bodies of calves and rabbits the eugonic element in each culture has been eliminated, the culture finally obtained being dysgonic and virulent.

Cultivation on glycerin media has been successful in eliminating the virulent element in one case only, H 49. " T.C." ; in this case a eugonic slightly virulent culture was obtained after one subculture on glycerin agar.

By means of plate culture, dysgonic virulent strains and eugonic slightly virulent strains have been obtained at one and the same time, from each of the two cultures.

The experiments show conclusively therefore, that each of these cultures is a mixture of two kinds of organisms, one with the properties of the bovine tubercle bacillus, the other with the properties of the human tubercle bacillus.

RESULTS OF THE SPECIAL INVESTIGATION OF THE TWO CULTURES H 60. "W.B." (bronchial gland) and H 90. "I.P." (retroperitoneal gland), ISOLATED SINCE THE SECOND INTERIM REPORT, WHICH EXHIBITED THE FEATURES OF THE TWO GROUP III. CULTURES.

SEPARATION EXPERIMENTS.

SUMMARY OF RESULTS.

Among the strains of culture isolated from human tuberculous lesions and investigated since the issue of the second interim report there were two which displayed the peculiarity of the two Group III. cultures [H 13. "A.D." (Calf 301) and H 49. "T.C." (mesenteric gland—Royalcot strain)] of which the results of the reinvestigation are given in the second part of this report.

This peculiarity was the association of high cultural luxuriance with the power to set up general progressive tuberculosis in calves and rabbits when inoculated subcutaneously.

The cultures (*i.e.* the bronchial gland strain of Virus H 60. "W.B." and the retroperitoneal gland strain of Virus H 90. "I.P.") were investigated therefore in exactly the same manner as the two above-mentioned Group III. cultures, with the object of ascertaining whether or no their exceptional properties were due to the association of virulent tubercle bacilli with eugonic slightly virulent tubercle bacilli.

The culture from Virus H 60. "W.B." was isolated from a guinea-pig which had been inoculated with an emulsion of the caseous bronchial glands of a child aged four years and seven months who died of general miliary tuberculosis. The culture was equal in virulence to a bovine tubercle bacillus, producing fatal general tuberculosis in calves after subcutaneous inoculation, but grew more readily on artificial media than bovine tubercle bacilli. Cultures from the meninges, lung, and mesenteric gland of the child grew luxuriantly on glycerin media and were only slightly virulent for calves and rabbits.*

The strain of Virus H 90. "I.P." investigated was obtained directly from the retroperitoneal gland of a man aged 70 who died of pneumonia. The culture grew luxuriantly on artificial media like the human tubercle bacillus ; it produced in calves slowly progressing tuberculosis not severe and not fatal within the period of observation, and in rabbits progressive tuberculosis not so quickly fatal as after the inoculation of equivalent doses of bovine tubercle bacilli. The culture was therefore not so virulent as the H 60. "W.B." strain. A culture isolated from the mesenteric gland of the same patient through the guinea-pig also grew luxuriantly, but was only slightly virulent for the rabbit.

Cultures obtained from distal lesions produced in the rabbits as well as the calves inoculated with the original strains (H 60. "W.B." bronchial gland, and H 90 "I.P." retroperitoneal gland) grew with difficulty on artificial media and were fully virulent ; the capacity to grow luxuriantly therefore was lost by both cultures in their passage through the bodies of the calf and rabbit, and bacilli were obtained which exactly resembled bovine tubercle bacilli in cultural characters and virulence.

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* Dr. Eastwood who tested the cultures shortly after their isolation found that the bronchial gland strain did not grow so well as the other three. Dr. Cobbett produced luxuriant growths on agar and glycerin serum with the 2nd generation of the bronchial gland strain. When I tested them after 10 months cultivation all the strains grew equally well on the glycerin media.

With a culture which inoculation tests showed to be largely composed of virulent bacilli it is not surprising that irregular results were at first obtained on artificial media; in this case long cultivation had apparently favoured the multiplication of the easy growing bacilli in the culture and their increased proportion then rendered it impossible to distinguish the culture from the other strains of the same virus.

Results similar to these had been obtained by passage through the animal body with the two Group III. cultures (H 13 and H 49) and with artificial mixtures of human and bovine tubercle bacilli (*see* Reports 5 and 6 in this Volume).

Attempts were made therefore to separate by means of the plate method of cultivation used for the Group III. cultures, the two kinds of tubercle bacilli of which the cultures under consideration were apparently composed.

These separation experiments were successful, and strains of culture raised from single colonies were obtained from each of the two cultures which corresponded exactly on the one hand to the human tubercle bacillus and on the other to the bovine tubercle bacillus.

The results showed conclusively therefore that the bronchial gland strain of H 60. "W.B." and the retroperitoneal gland strain of H 90. "I.P." were mixtures containing bovine and human tubercle bacilli.

Attempts were also made to eliminate the virulent bacilli from the cultures by growing them for a period on a medium containing glycerin.

After subculture on glycerin-serum both cultures were still virulent for rabbits; in both cases, however, the virulence was reduced. The failure to eliminate the virulent bacilli by this means was due to the fact that the virulent bacilli grew on glycerin serum fairly readily.

The details and results of the experiments with each culture are set out under the three headings "Separation by Animal Inoculation," "Separation by Glycerin Media," and "Separation by Plate Cultures."

A. STANLEY GRIFFITH.

VIRUS H 60. "W.B." (Bronchial gland strain.)

SEPARATION BY ANIMAL INOCULATION.

(*See* Tables L and M.)

Calves.—Calf 1099 was inoculated subcutaneously with 50 mg. and Calves 1107 and 1109 each with 10 mg. of culture derived from the bronchial gland of H 60. W.B. through guinea-pig 1825.

The first calf died of severe generalised tuberculosis in 28 days ; the other two died of generalised tuberculosis in 58 and 32 days respectively.

Cultures were isolated from the spleen of Calf 1099 and from the prescapular and portal glands of Calf 1107.

The strain from Calf 1099 grew well on some media, particularly on potato, on which it produced a layer indistinguishable from that produced by a Group II. bacillus. The strains from Calf 1107 were dysgonic.

Rabbits.—Cultures have been isolated from a number of rabbits inoculated at various times to test the virulence of the bronchial gland strain.

The first, No. 908, inoculated intraperitoneally with 1 mg., died in 33 days of general tuberculosis ; the culture isolated from the lung grew poorly on most media but well on potato ; it probably contained a small proportion of eugonic and a large proportion of dysgonic bacilli.

The second, No. 951, inoculated intraperitoneally with 1 mg., was killed after 103 days and found to have general tuberculosis ; the culture isolated from a kidney was dysgonic.

The third, No. 935, inoculated intraperitoneally with 0·1 mg., died of general tuberculosis in 82 days ; a culture isolated from it was dysgonic. A few small colonies appeared on a glycerin serum tube, and it was thought that these might be composed of eugonic slightly virulent bacilli only ; one of the colonies therefore when it was 31 days old was removed and inoculated intraperitoneally into Rabbit 1017 ; this rabbit died of general tuberculosis in 32 days ; cultures were again obtained on a glycerin serum tube, and a single colony was emulsified and inoculated subcutaneously into Rabbit 1121 ; this rabbit died in 112 days of general tuberculosis, and a culture isolated from it was dysgonic.

Passage through the bodies of calves as well as rabbits had eliminated the eugonic bacilli in the culture

SEPARATION BY GLYCERIN MEDIA.

(*See* Tables M and N.)

Cobbett attempted by means of glycerin serum to separate the eugonic bacillus from the virulent bacillus when these had been properly mixed. He took a single colony from a glycerin serum tube, subcultivated for three generations, and then inoculated two rabbits (Nos. 949 and 950) intraperitoneally, each with 1 mg. ; one died in 31 days of general tuberculosis, the other was killed after 103 days and showed general progressive tuberculosis, the long duration of life being due to the intracoecal inoculation of some of the dose.

From each of these rabbits I isolated a culture ; the cultures made in the usual way, by scraping the surface of an egg tube, were dysgonic. Numerous colonies were obtained on a glycerin serum tube sown from Rabbit 949 ; since one does not commonly get a good primary growth of virulent bacilli on glycerin serum it was thought that these colonies might be the product of slightly virulent bacilli ; one colony was selected, emulsified, and inoculated intraperitoneally into a rabbit (No. 1018) ; this animal died in 30 days of miliary tuberculosis. Numerous colonies were again obtained on glycerin serum, and when 36 days old, one was removed, emulsified and inoculated subcutaneously into Rabbit 1120 ; this rabbit died in 246 days of general tuberculosis and a culture obtained from it was dysgonic.

Another attempt was equally unsuccessful. The culture, when it was 10 months old (10th generation) and had been grown for two generations on glycerin media, was inoculated intraperitoneally into two rabbits, each rabbit receiving half a glycerin serum culture ; the rabbits died of general tuberculosis in 109 and 128 days respectively.

The same strain was subcultivated on serum for two more months and then inoculated into a calf (Calf 1203) in a dose of 48 mg., and into a series of four rabbits. The calf was killed when well after 97 days and showed general tuberculosis of a retrogressive character ; all the rabbits died of general tuberculosis, but the duration of life was longer than in rabbits inoculated with equivalent doses of bovine tubercle bacilli. The residence on glycerin media had diminished but had not eliminated the virulence of the culture.

From one of the egg tubes sown with an emulsion from the prescapular gland of the calf (1203), 12 single colonies were taken and separately subcultivated on serum ; after two generations on serum each strain was inoculated subcutaneously into a rabbit. One rabbit died prematurely ; all the others developed generalised progressive tuberculosis.

Two rabbits were inoculated subcutaneously with emulsions of tuberculous tissues from Calf 1203, one from the prescapular gland and one from a bronchial gland ; they died of general tuberculosis in 138 and 111 days respectively. The cultures isolated from the prescapular gland, a bronchial gland, and the spleen of the calf were all dysgonic.

Subculture on glycerin serum, therefore, failed in this case to eliminate the virulent bacillus.

SEPARATION BY PLATE CULTURES.

(*See* Table O.)

Glycerin serum plates were sown with an emulsion of the caseous sternal gland of a guinea-pig, No. 2489, which had been inoculated intraperitoneally with the bronchial gland strain of H 60. W.B. ; the guinea-pig was killed 16 days after inoculation and showed early general tuberculosis.

The plates were incubated for several weeks and only six colonies altogether developed ; three of these were large, one was small, and two were of intermediate size. Separate subcultures were made on glycerin serum from each of the six colonies, and after 19 days' cultivation, the whole of the growth from one tube was, in the case of each strain, inoculated subcutaneously into a rabbit ; the growths were better on some tubes than on others and therefore the doses varied.

One of the rabbits (strain from Colony 2) died in 11 days from causes other than tuberculosis, two (strains from Colonies 5 and 4) died in 53 and 96 days of general tuberculosis ; the others (strains 6, 1 and 3) were killed 99 days after inoculation ; one had chronic general tuberculosis, another had a local lesion and slight retrogressive tuberculosis of the lungs, and the remaining one had a local lesion only.

Later on, three of the strains, those from Colonies 2, 5 and 1, were retested on rabbits ; in each case two rabbits were inoculated intravenously, one with 0·1 mg., the other with 0·01 mg. ; the two rabbits inoculated with the strain from Colony 5 which had when first tested produced general tuberculosis in the rabbit inoculated subcutaneously, died in 42 and 67 days of general tuberculosis ; the remaining four (inoculated with strains 2 and 1) were killed 128 days later and showed a very limited retrogressive tuberculosis.

In the event that it were found that none of the eugonic strains was composed solely of slightly virulent bacilli, one of the strains, that from Colony 1, was inoculated into a guinea-pig (No. 2817) and plate cultures were made from its tuberculous organs. On all the plates numerous colonies appeared; they were of one kind and grew to a large size. Separate colonies were not investigated since the result of the first experiment, which by this time had been ascertained, left little room for doubt that the strain was a pure culture of slightly virulent bacilli. A culture obtained from the guinea-pig in the ordinary way but cultivated throughout on glycerin serum had slight virulence only for the rabbit and grew luxuriantly on the differential media.

Two of the strains, those from Colonies 1 and 5, were subsequently inoculated subcutaneously each into a calf (dose 50 mg.) and into rabbits. The strain from Colony 1 which grew luxuriantly on artificial media produced slight retrogressive tuberculosis in the calf (Calf 1481) and the rabbits; the strain from Colony 5, which grew poorly on artificial media, gave rise to fatal generalised progressive tuberculosis in the calf (Calf 1425) and the rabbits.

The inoculation experiments with the six strains showed therefore that three of the strains were virulent and three slightly virulent for the rabbit. The three slightly virulent strains (from Colonies 1, 2, and 3) grew well on artificial media and resembled therefore a Group II. bacillus; two of the virulent strains (from Colonies 4 and 5) grew poorly and resembled exactly a bovine tubercle bacillus; the other virulent strain (from Colony 6) grew well and resembled the original culture.

An unsuccessful attempt was made to separate a eugonic and a dysgonic bacillus from the original culture directly; an emulsion of the culture was made, diluted, and sown over the surface of glycerin serum plates. Ten single colonies were chosen, separately subcultivated on serum, and then tested on rabbits; in the case of each strain a rabbit was inoculated subcutaneously with the growth from one serum tube. Three of the rabbits died prematurely, four died of general tuberculosis.

SUMMARY.

From the culture derived from the bronchial gland of Virus H 60. "W.B." the eugonic element was eliminated by passage through the bodies of calves and rabbits, and there remained a dysgonic fully virulent bacillus; and by means of the plate method of cultivation strains of culture have been obtained with the properties of the human and the bovine tubercle bacillus respectively.

VIRUS H 90. "I.P." (Retroperitoneal Gland Strain.)

SEPARATION BY ANIMAL INOCULATION.

(*See* Tables P, Q and R.)

Calves.—Two calves were inoculated subcutaneously when the culture had been 340 days in artificial cultivation, one calf (No. 1383) receiving 50 milligrammes, the other (No. 1471) 80 milligrammes. They were killed in good health 92 and 90 days respectively after inoculation and showed generalised tuberculosis not severe but obviously progressive.

Cultures were isolated from the lung, spleen and a pudic gland of Calf 1383 and the prescapular gland and a bronchial gland of Calf 1471.

All the strains were identical in their cultural characters and resembled the more difficultly growing bovine viruses; they produced on serum glycerin-serum and potato thin grey layers, and on agar very scanty growths.

The strain from the pudic gland of Calf 1383 produced in a calf inoculated subcutaneously with 50 milligrammes generalised progressive tuberculosis fatal in 42 days.

The strain from the bronchial gland of Calf 1471 inoculated subcutaneously into a calf in a dose of 45 milligrammes produced generalised tuberculosis fatal in 21 days.

After passage through the calf therefore, the easy growing bacilli in the culture inoculated were eliminated and there remained dysgonic virulent bacilli identical in every respect with bovine tubercle bacilli.

Rabbits.—Cultures have been recovered from four of the rabbits inoculated with the original strain.

Two of the rabbits were killed 111 days after subcutaneous inoculation with 10 milligrammes of culture, and showed general progressive tuberculosis. Cultures were isolated from the scapular gland and a kidney of one (No. 1553) and from one of the kidneys of the other (1554); the two strains from the kidneys grew poorly on glycerin, that from the scapular gland produced pigmented layers on serum and a yellow wrinkled layer on potato; the strain from the scapular gland therefore still contained eugonic bacilli while those from the kidneys were purely dysgonic.

The other two cultures were obtained from two rabbits which had been inoculated intravenously one with 0·1, the other with 0·01 milligramme.

One of the rabbits (No. 1794, dose 0·1 mg.) died of general tuberculosis in 64 days and the culture was obtained from the lung, the other (No. 1795, dose 0·01 mg.) died of general tuberculosis in 116 days and the culture was obtained from the kidney.

The strain from the kidney of rabbit 1795 was dysgonic, that from the lung of rabbit 1794 was lost before its cultural characters had been determined.

Both strains were tested on rabbits and found to be fully virulent.

Passage through the rabbit therefore had the same effect on the culture as passage through the calf:—the eugonic bacilli were eliminated and dysgonic virulent bacilli alone remained.

Goat.—The retroperitoneal gland strain was at first thought to be a pure culture of slightly virulent bacilli like the strain from the mesenteric gland and in this belief it was used in a good many experiments made to compare the effects of slightly virulent and virulent bacilli.

One of these experiments was with a goat which was inoculated subcutaneously with the object of ascertaining whether human tubercle bacilli are excreted in the milk of an animal after subcutaneous inoculation.

The goat received 50 milligrammes of a glycerin serum culture under the skin of the neck and was killed 103 days later.

The milk of the goat withdrawn at intervals of 24 hours during the first eight days and then on the 14th, 21st and 75th days after her inoculation produced tuberculosis in guinea pigs, and from one of these guinea-pigs (one inoculated with the 14th day milk) a culture was isolated; this culture grew well on artificial media and had low virulence for the rabbit.

The post-mortem examination of the goat showed a small local lesion, caseous nodules in the adjacent prescapular gland, a number of small grey tubercles in the lungs and one in each kidney, soft yellow tubercles in the mesenteric glands, and several miliary fibro-caseous tubercles in the mamma.

An emulsion of the prescapular gland was inoculated subcutaneously into two rabbits both of which died of general tuberculosis one in 145 the other in 157 days, and a culture was isolated from the lung of each. Both cultures were dysgonic and one was shown to be fully virulent for the rabbit.

The culture raised directly from the prescapular gland was eugonic and after 301 days artificial cultivation was found to be slightly virulent for rabbits.

The result therefore of the inoculation of the culture into the goat is the exact converse of that following the inoculation into the calf. In the calf dysgonic virulent bacilli only were isolated from the distal lesions while the culture from the nearest gland was composed of virulent bacilli with a slight admixture of easy-growing bacilli. In the goat on the other hand apparently only eugonic slightly virulent bacilli were disseminated, the culture from a remote part (the mamma) being composed wholly of bacilli of this type, while in the gland nearest the local lesion the bacilli were mainly of the eugonic slightly virulent type, virulent tubercle bacilli being present in very small numbers, as shown by the results in rabbits of the inoculation of an emulsion of the gland.

The difference in the results obtained with the goat from those obtained with the calf was probably due to the fact that a glycerin serum and not a serum culture was used Growth on glycerin serum had reduced the proportion of the virulent bacilli by favouring the multiplication of the more easy-growing slightly virulent bacilli.

SEPARATION EXPERIMENT ON GLYCERIN MEDIA.

(*See* Table Q.)

When the culture had been over 16 months in artificial cultivation on serum, it was sown on glycerin serum and subcultivated continuously on this media for four months. The culture was then tested on a series of rabbits (Nos. 2300–2302) all of which died of general tuberculosis. Cultivation on glycerin serum had not therefore eliminated the virulent bacilli in the culture.

SEPARATION BY PLATE CULTURES.

(*See* Table S.)

Culture from Guinea-pig 3300.

A guinea-pig, No. 3300, was inoculated intraperitoneally with the retro-peritoneal gland strain and killed 21 days afterwards. Serum plates and egg tubes were sown with emulsions from a sternal gland and the pyloric gland; the serum plates became so closely covered with colonies that it was impossible to pick off single colonies. On the egg tubes however sown from the pyloric gland the colonies were in places sufficiently discrete, and three large colonies were taken and separately subcultivated. The three strains produced pigmented growths on serum and they were each tested on a series of rabbits intravenously and found to be slightly virulent.

Culture from Rabbit 2019.

Separate colonies were also investigated from a rabbit which had been inoculated intravenously with the original culture at the same time as the guinea-pig. It died of acute tuberculosis in 20 days. Five colonies were taken from two egg tubes (which had been sown with an emulsion of the spleen) and separately cultivated; three were tested on rabbits, each strain being inoculated intravenously into two rabbits in doses of 0·1 and 0·01 milligramme; two of the strains produced rapidly fatal tuberculosis in all the animals inoculated and were equal in virulence to a bovine tubercle bacillus; one of the two rabbits inoculated with the third strain died in 17 days of coccidiosis of the liver and showed slight tuberculosis of the lungs, the other was killed after 104 days and showed disseminated tuberculosis of a type not unusual with viruses of low bovine virulence.

The two virulent strains grew poorly on glycerin media; the third strain was lost before it was tested on glycerin media, but it produced pigmented growths on serum.

From the original culture through the guinea-pig therefore three strains of culture have been isolated which are identical with the human tubercle bacillus, and from a rabbit inoculated with the original culture there have been isolated one strain with the properties of the human tubercle bacillus and two with the properties of the bovine tubercle bacillus.

SUMMARY.

From the culture derived from the retroperitoneal gland of Virus H 90. "I.P." bacilli with the properties of the human and the bovine tubercle bacillus respectively have been obtained by passage through the animal body and by means of the plate method of cultivation.

A. Stanley Griffith.

TABULAR SUMMARIES OF THE PRELIMINARY INOCULATION TESTS WITH VIRUSES H 2, H 13, H 16, H 17, AND H 49.

			PAGE
Virus H 2.	"Sp. A."	Strain derived from Calf 93 " " Calf 111	24
Virus H 13.	"A.D."	Strain derived from Calf 301 " " Rat 15	24
Virus H 16.	"J.H."	Strain derived from Calf 275 " " Bull 423A " " Calf 559	2
Virus H 17.	"Sp. B."	Strain derived from Calf 265 " " Calf 539 (through Rabbit 181) " " Calf 539 (through Rabbit 181 and Guinea pig 2017).	26
Virus H 49.	"T.C."	Strain derived from original material (Blythwood Strain " " (Royalcot Strain) Strain derived from Calf 797 " " Calf 787	27

VIRUS H 2. "Sp. A."

Culture derived from Calf 93 through G.P. 534.

Total duration of artificial cultivation—3 years 8 months. The 30th generation of culture was used when 21 days old.

Number of Rabbit.	Mode of Inoculation.	Dose in Milli-grammes.	Weight.		Duration of Life.	Result.
			Initial.	Final.		
1165	Intrav. Subcut.	1·0 1·0	1,700	1,200	Died 18 days	General tuberculosis.
1166	Intrav.	0·1	1,900	1,430	Died 27 „	General tuberculosis.
1167	Intrap.	10·0	1,750	1,250	Died 20 „	General tuberculosis.
1168	Intrap.	1·0	2,000	1,420	Died 33 „	General tuberculosis.
1169	Subcut.	10·0	1,700	1,590	Died 5 „	No tuberculosis. Death from heart disease.

Culture derived from Calf 111 through G.P. 640.

Total duration of artificial cultivation—3 years 3 months. The subculture was used when 21 days old.

Number of Rabbit.	Mode of Inoculation.	Dose in Milli-grammes.	Weight.		Duration of Life.	Result.
			Initial.	Final.		
1061	Intrav.	1·0	1,100	1,250	Killed 111 days	Very slight tuberculosis of lungs and kidneys.
1062	Intrav.	0·1	950	2,100	„ „	Slight tuberculosis of lungs and kidneys.
1063	Intrap.	10·0	1,100	2,400	„ „	Slight general tuberculosis.
1064	Intrap.	1·0	850	1,750	„ „	Very slight general tuberculosis.
1065	Subcut.	50·0	900	1,900	„ „	Local lesion: one tubercle in lung.
1066	Subcut.	10·0	850	2,100	„ „	Local tuberculosis only.
1067	Subcut.	1·0	950	2,250	„ „	Local tuberculosis only.

VIRUS H 13. "A.D."

Culture derived from Calf 301. (Thoracic Gland.)

Total duration of artificial cultivation—3 years. The 28th generation of culture was used when 21 days old.

Number of Rabbit.	Mode of Inoculation.	Dose in Milli-grammes.	Weight.		Duration of Life.	Result.
			Initial.	Final.		
1136	Intrav.	1·0	2,950	2,300	Died 18 days	General tuberculosis.
1137	Intrav.	0·1	2,370	1,700	Died 27 „	General tuberculosis.
1138	Intrap.	10·0	2,070	1,470	Died 12 „	Acute tuberculosis.
1139	Intrap.	1·0	1,490	1,100	Died 27 „	General tuberculosis.
1140	Subcut.	10·0	1,620	1,220	Died 52 „	General tuberculosis.
1141	Subcut.	10·0	1,000	850	Died 2 „	No tuberculosis.

The culture was again tested a year later to ascertain whether there had been any alteration in virulence. The 39th generation of culture was used when 7 days old.

1712	Intrav.	1·0	1,450	1,200	Died 11 days	General tuberculosis.
1710	Intrav.	0·1	2,100	1,600	Died 25 „	General miliary tuberculosis.
1711	Intrav.	0·1	1,700	1,300	Died 29 „	Acute miliary tuberculosis.
1713	Subcut.	20·0	—	—		

Culture derived from Calf 301 through Rat 15.

Total duration of artificial cultivation—2 years 7½ months. The 25th generation of culture was used when 21 days old.

Number of Rabbit.	Mode of Inoculation.	Dose in Milli-grammes.	Weight.		Duration of Life.	Result.
			Initial.	Final.		
1176	Intrav.	1·0	1,570	1,300	Died 15 days	General tuberculosis.
1177	Intrav.	0·1	800	750	Died 25 ,,	General tuberculosis.
1178	Intrap.	1·0	800	1,100	Died 101 ,,	General tuberculosis (injection partly intracoecal).
1179	Intrap.	0·1	600	900	Died 106 ,,	General tuberculosis (injection partly subcutaneous and probably partly intracoecal).

VIRUS H 16. "J.H."

Culture derived from Calf 273. (Prescapular Gland.)

Total duration of artificial cultivation—3 years. The 36th generation of culture was used when 21 days old.

Number of Rabbit.	Mode of Inoculation.	Dose in Milli-grammes.	Weight.		Duration of Life.	Result.
			Initial.	Final.		
1106	Intrav.	1·0	1,350	2,300	Killed 94 days	Slight tuberculosis of lungs and kidneys.
1107	Intrav.	0·1	1,000	1,850	,, ,,	Very slight general tuberculosis.
1108	Intrap.	10·0	1,050	1,700	,, ,,	Very slight general tuberculosis.
1109	Intrap.	1·0	1,020	2,050	,, ,,	Tuberculosis of peritoneum and kidneys.
1110	Subcut.	30·0	1,100	2,350	,, ,,	Slight general tuberculosis.
1111	Subcut.	10·0	950	1,850	,, ,,	Local lesion and slight tuberculosis of lungs.

Culture derived from Bull 423A. (Prepectoral Gland.)

Total duration of artificial cultivation—2 years 6 months. The 29th generation of culture was used when 21 days old.

Number of Rabbit.	Mode of Inoculation.	Dose in Milli-grammes.	Weight.		Duration of Life.	Result.
			Initial.	Final.		
1131	Intrav.	1·0	1,700	1,380	Died 17 days	General tuberculosis.
1132	Intrav.	0·1	1,200	1,050	Died 20 ,,	General tuberculosis.
1133	Intrap.	10·0	1,150	830	Died 17 ,,	General tuberculosis.
1134	Intrap.	1·0	1,250	900	Died 26 ,,	General tuberculosis.
1135	Subcut.	10·0	1,550	1,360	Died 126 ,,	General tuberculosis.

Culture derived from Calf 559. (Hepatic Gland.)

Total duration of artificial cultivation—2 years 1½ months. The 25th generation of culture was used when 21 days old.

Number of Rabbit.	Mode of Inoculation.	Dose in Milli-grammes.	Weight		Duration of Life.	Result.
			Initial.	Final.		
1126	Intrav.	1·0	1,550	1,100	Died 20 days	General tuberculosis
1127	Intrav.	0·1	1,950	1,190	Died 109 „	Tuberculosis of lungs and kidneys (severe) and large intestines.
1128	Intrap.	10·0	3,050	1,720	Died 80 „	General tuberculosis (injection mainly intracoecal).
1129	Intrap.	1·0	1,850	1,510	Died 24 „	General tuberculosis.
1130	Subcut.	10·0	1,700	1,570	Died 119 „	General tuberculosis.

VIRUS H 17. "Sp. B."

Culture derived from Calf 265. (Prescapular Gland.)

Total duration of artificial cultivation—3 years. The 30th generation of culture was used when 21 days old.

Number of Rabbit.	Mode of Inoculation.	Dose in Milli-grammes.	Weight.		Duration of Life.	Result.
			Initial.	Final.		
1100	Intrav.	1·0	900	1,750	Killed 97 days	Slight general tuberculosis.
1101	Intrav.	0·1	850	1,950	„ „	Slight general tuberculosis.
1102	Intrap.	10·0	700	1,150	„ „	Slight general tuberculosis.
1103	Intrap.	1·0	670	1,550	„ „	Slight general tuberculosis.
1104	Subcut.	50·0	540	1,450	„ „	Local tuberculosis and miliary tuberculosis of the lungs.
1105	Subcut.	10·0	670	1,900	„ „	Local tuberculosis and miliary tuberculosis of the lungs.

Culture derived from Calf 539, through Rabbit 181.

Total duration of artificial cultivation—2 years 2 months. The 27th generation of culture was used when 21 days old.

Number of Rabbit.	Mode of Inoculation.	Dose in Milli-grammes.	Weight.		Duration of Life.	Result.
			Initial.	Final.		
1113	Intrav.	1·0	900	1,900	Killed 97 days	Tuberculosis of lungs and kidneys.
1112	Intrav.	0·1	900	2,020	„ „	Slight tuberculosis of lungs and kidneys.
1114	Intrap.	10·0	410	1,300	„ „	Chronic general tuberculosis.
1115	Intrap.	1·0	450	1,500	„ „	Local tuberculosis and slight tuberculosis of lungs.
1116	Succut.	47·5	430	1,750	„ „	Local tuberculosis and slight tuberculosi of lungs.
1117	Subcut.	10·0	410	1,600	„ „	Local tuberculosis and slight tuberculosis of lungs.

Culture derived from Calf 539 through Rabbit 181 and Guinea-pig 2017.

Total duration of artificial cultivation—53 days. The 4th generation of culture was used when 20 days old.

Number of Rabbit.	Mode of Inoculation.	Dose in Milli-grammes.	Weight.		Duration of Life.	Result.
			Initial.	Final.		
1142	Intrav.	1·0	1,850	1,000	Killed 85 days	General tuberculosis complicated with pseudo-tuberculosis.
1143	Intrav.	0·1	1,450	2,300	Killed 85 „	Tuberculosis of lungs and kidneys.
1144	Intrap.	10·0	1,750	1,350	Died 11 „	Early tuberculosis of omentum: no sign of disease elsewhere.
1145	Intrap.	1·0	1,070	2,300	Killed 85 „	Slight general tuberculosis.

VIRUS H 49. "T.C."

Culture derived from the Mesenteric Glands, direct. Blythwood strain.

Total duration of artificial cultivation—1 year 8½ months. The 21st generation of culture was used when 22 days old.

Number of Rabbit.	Mode of Inoculation.	Dose in Milli-grammes.	Weight.		Duration of Life.	Result.
			Initial.	Final.		
1048	Intrav.	1·0	1,100	2,600	Killed 130 days	Slight tuberculosis of lungs and kidneys.
1049	Intrav.	0·1	1,150	1,050	Died 11 „	Pseudo-tuberculosis.
1051	Intrap.	10·0	1,250	2,500	Killed 130 „	Slight tuberculosis of omentum and (?) of lungs.
1050	Intrap.	1·0	1,450	3,050	Killed 130 „	Slight tuberculosis of omentum, kidneys and lungs.
1052	Subcut.	10·0	1,150	2,700	Killed 130 „	Local lesion and slight tuberculosis of lungs.
1053	Subcut.	1·0	1,250	2,800	Killed 130 „	Local lesion only.

Culture derived from the Mesenteric Glands, direct. Royalcot strain.

Total duration of artificial cultivation—1 year 10½ months. The 25th generation of culture was used when 21 days old.

Number of Rabbit.	Mode of Inoculation.	Dose in Milli-grammes.	Weight.		Duration of Life.	Result.
			Initial.	Final.		
1180	Intrav.	1·0	1,000	1,000	Died 16 days	General tuberculosis.
1181	Intrav.	0·1	1,100	920	Died 31 „	General miliary tuberculosis.
1182	Intrap.	1·0	750	2,050	Killed 163 „	Chronic general tuberculosis (injection intracoecal).

Culture derived from Calf 797. (Prescapular Gland.)

Total duration of artificial cultivation—1 year 4 months. The 13th generation of culture was used when 22 days old.

Number of Rabbit.	Mode of Inoculation.	Dose in Milli-grammes.	Weight.		Duration of Life.	Result.
			Initial.	Final.		
1071	Intrav.	1·0	1,300	1,240	Died 13 days	General tuberculosis.
1072	Intrav.	0·1	1,450	1,470	Died 16 „	General tuberculosis.
1073	Intrap.	10·0	1,300	1,110	Died 12 „	Acute tuberculosis complicated by severe psorospermosis.
1074	Intrap.	1·0	950	770	Died 13 „	General tuberculosis.
1075	Subcut.	10·0	900	1,060	Died 41 „	General tuberculosis.
1076	Subcut.	1·0	900	950	Died 80 „	General tuberculosis.

Culture derived from Calf 787.

Total duration of artificial cultivation—1 year 4 months. The 13th generation of culture was used when 21 days old.

Number of Rabbit.	Mode of Inoculation.	Dose in Milli-grammes.	Weight.		Duration of Life.	Result.
			Initial.	Final.		
1079	Intrav.	1·0	1,850	1,460	Died 17 days	General tuberculosis.
1080	Intrav.	0·1	1,800	1,790	Died 19 „	General tuberculosis.
1081	Intrap.	10·0	1,870	1,270	Died 14 „	General tuberculosis.
1082	Intrap.	1·0	1,720	1,470	Died 19 „	General tuberculosis.
1083	Subcut.	10·0	1,720	1,050	Died 71 „	General tuberculosis.
1084	Subcut.	1·0	1,600	1,800	Died 90 „	General tuberculosis.

VIRUS H 49. "T.C."

Culture derived from the Mesenteric Glands (Blythwood Strain).

CULTURE INOCULATIONS.

The strain was derived from the original material, and had been in cultivation a total period of 1 year 11 months.

The 25th generation of culture was used on Feb. 26, 1907, when 21 days old.

CALF 1191.
Subcutaneous.
Dose : 50·0 mg.
Killed : May 31, 1907.
94 days.
P.M.—Local tuberculosis only.

Rabbit 1318. Subcut.
(Emulsion of prescapular gland.)
Killed : 129 days.
Local lesion only.

CALF 1193.
Subcutaneous.
Dose : 100·0 mg.
Killed : June 5, 1907.
99 days.
P.M.—Local tuberculosis only

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1193	Subcut.	100·0 mg.	K. 142 days	Local T. only.
1192	Subcut.	45·0 mg.	K. 142 „	Local T. only.

CHARTS OF SEPARATION EXPERIMENTS WITH VIRUSES H 13."A.D.," H 49."T.C.," H 60."W.B.," AND H 90."I.P."

Virus H 13. "A.D." (Calf 301 Strain.)

Table A.—Separation by animal inoculation (Calf).
,, B.— ,, ,, ,, ,, (Rabbit).
,, C.—Separation by glycerin media.
,, D.—Investigation of separate colonies.
,, E.— ,, ,,
,, F.— ,, ,,

Virus H 49. "T.C." (Original Strain).

Table G.—Rabbit inoculations with the original culture.
,, H.—Separation by animal inoculation (Calf).
,, I.—Investigation of separate colonies.
,, J.— ,, ,,
,, K.— ,, ,,

Virus H 60. "W.B." (Bronchial Gland Strain.)

Table L.—Separation by animal inoculation (Calf).
,, M.—{ Separation by animal inoculation (Rabbit).
Investigation of a single colony on glycerin serum. }
,, N.—Test of original culture after growth on glycerin media.
,, O.—Investigation of separate colonies.

Virus H 90. "I.P." (Retroperitoneal Gland Strain.)

Table P.—Separation by animal inoculation (Calf).
,, Q.— ,, ,, ,, ,, (Rabbit).
,, R.— ,, ,, ,, ,, (Goat).
,, S.—Investigation of separate colonies.

TABLE A.

VIRUS H 13. "A.D."

CULTURE DERIVED FROM CALF 301 (THORACIC GLAND).

SEPARATION BY ANIMAL INOCULATION

CULTURE INOCULATION.

The strain had been 3 years 2 months in artificial cultivation ; the 31st generation of culture was used on March 23. 1907, when 21 days old.

CALF 1175.
Subcutaneous.
Dose : 100·0 mg.
Killed : June 12, 1907.
81 days.
P.M.—Tuberculosis generalized but not severe.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1225	Subcut.	50·0 mg	D. 28 days	G.T.
1226	Subcut.	10·0 mg.	K. (ill) 107 days	Chronic G.T.

Kill

P.M.–
lized but

—	Num
E. of prescapular gland.	138
E. of spleen	138
	138

CALF 1237.
Subcutaneous.
Dose : 20·0 cc. of emulsion of prescapular gland (T.B. numerous)
Killed : Aug. 3, 1907 (when very ill).
52 days.
P M.—General tuberculosis, severe.

CULTURE.

The strain was derived from

RABBITS.

—	Number.	Method.	Duration of Life.	Result.
E. of prescapular gland.	1336	Subcut.	D. 78 days	G.T.
E. of mediastinal gland.	1337	Subcut.	D. 92 ,,	G.T.
	1338	Subcut.	D. 47 ,,	G.T

A culture was obt

The 17th generation of cu' ture was used on March 3, 1908, when 23 days old, for inoculating :—

RABBITS.

Number.	Method.	Dose.	Duration of Life.

TABLE B.

VIRUS H 13. "A.D."

CULTURE DERIVED FROM CALF 301 (THORACIC GLAND).

SEPARATION BY ANIMAL INOCULATION.

I.

RABBIT 1137.

Inoculated intravenously on February 4, 1907, with 0·1 mg. of culture derived from Calf 301 ; the 29th generation of culture was used when 21 days old.
The Rabbit died in 27 days of general tuberculosis.

CULTURE.

A culture was raised from the spleen, on glycerin-serum.
The 4th generation on glycerin-serum was used for inoculation on June 5, 1907, when 21 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1326	Intrav.	1·0 mg.	D. 10 days	Early T.
1327	Subcut.	40·0 mg.	D. 28 ,,	G.T.
1328	Subcut.	10·0 mg.	D. 4 ,,	No T.

CULTURE.

A culture was raised from the spleen, on serum.
The 11th generation on serum was used on October 2, 1907, when 14 days old.

RABBIT 1526.

Subcutaneous.
Dose : 1 serum tube.
Died : 62 days. G.T.

II.

RABBIT 1140.

Inoculated subcutaneously on February 4, 1907, with 10·0 mg. of culture derived from Calf 301 ; the 29th generation of culture was used when 21 days old.
The Rabbit died in 52 days of general tuberculosis.

CULTURE.

A culture was raised from the lung.
The 9th generation on serum was used for inoculation on October 2, 1907, when 14 days old.

RABBIT 1527.

Subcutaneous.
Dose : 1 serum tube.
Died : 29 days. G.T.

TABLE C.

VIRUS H 13. "A.D."

CULTURE DERIVED FROM CALF 301 (THORACIC GLAND).

TESTED AFTER GROWTH ON GLYCERIN MEDIA.

The strain had been 3 years 2 months in artificial cultivation ; the 33rd generation of culture was used on March 26, 1907, when 14 days old ; the two previous generations had been on glycerin-serum.

CALF 1207.

Subcutaneous.
Dose : 100·0 mg.
Killed : June 26, 1907.
92 days.
P.M.—Tuberculosis generalised but not severe.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1236	Subcut.	50·0 mg.	D. 103 days	G.T. of a chronic type.
1237	Subcut.	10·0 mg.	D 100 ,,	G.T. of a chronic type.

RABBITS.

—	Number.	Method.	Duration of Life.	Result.
E. of prescapular gland.	1354	Subcut.	D. 92 days	G.T.
	1355	Subcut.	D. 9 ,,	No T.
E. of mediastinal gland.	1356	Subcut.	D. 5 ,,	No T.
	1357	Subcut.	D. 53 ,,	G.T.

TABLE D.

VIRUS H. 13. "A.D."

CULTURE DERIVED FROM CALF 301 (THORACIC GLAND).

INVESTIGATION OF SEPARATE COLONIES.

GUINEA-PIG 2491.

Inoculated on July 4, 1907, intraperitoneally with an emulsion of a large raised colony from an egg tube; [the culture was the 25th generation, 205 days old].

The guinea-pig was killed 25 days later, and cultures were sown from a caseous sternal gland.

CULTURES.

Ten single colonies from the glycerin-serum plates sown from the guinea pig were separately cultivated.

Growths from glycerin-serum tubes of the 2nd generation of each of the ten strains were inoculated into rabbits on September 30 and October 1, 1907.

RABBITS.

Number.	Method.	No. of Colony.	Dose.	Duration of Life.	Result.
1512	Subcut.	Col. 1	½ glyc. serum tube	K. 98 days	Slight G.T.
1513	Subcut.	,,	Do. large dose	K. 106 ,,	G.T.
1514	Subcut.	Col. 2	½ glyc. serum tube; large dose.	K. 98 ,,	Local T., and a few (?) tubercles in the lung.
1515	Subcut.	,,	Do. do.	K. 106 ,,	Gen. progressive T.
1516	Subcut.	Col. 3	1 glyc. serum tube; large dose.	K. 106 ,,	Local lesion. Slight T. of lungs and kidneys.
1517	Subcut.	Col. 4	Not so large as 1516.	D. 64 ,,	G.T.
1518	Subcut.	Col. 5	Not so large as 1517.	D. 36 ,,	G.T.
1519	Subcut.	Col. 6	1 glyc. serum tube; large dose.	K. 106 ,,	Local lesion. T. of lungs. One tubercle in a kidney
1520	Subcut.	Col. 7	Do. do.	D. 46 ,,	G.T.
1521	Subcut.	Col. 8	1 glyc. serum tube; dose smaller than others.	K. 106 ,,	Local lesion. T. of lungs. One tubercle in kidney.
1522	Subcut.	Col. 9	1 glyc. serum tube; large dose	K. 106 ,,	Local lesion. Slight T. of lungs and pleura.
1523	Subcut.	Col. 10	Do. do.	K. 106 ,,	G.T.

The culture raised from Colony 9 was retested on January 15, 1908, on a series of Rabbits with estimated doses. The 8th generation of culture was used when 27 days old.

1666	Intrav.	Col. 9	1·0 mg.	D. 80 days	G.T.
1665	Intrav.	,,	0·1 mg.	D. 71 ,,	Severe G.T.
1667	Subcut.	,,	68·0 mg.	D. 66 ,,	G.T. not severe.

COLONY No. 2.

Culture of the 6th generation from Colony No. 2, was used on November 12, 1907, when 10 days old, for inoculating: –

CALF 1301.

Subcutaneous.
Dose: 100·0 mg.
Died: Jan. 2, 1908
51 days.

P M.—General tuberculosis, very severe in lungs.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1560	Intrav.	1·0 mg.	D. 19 days	Acute G.T.
1559	Intrav.	0·01 mg.	D. 83 ,,	G.T.

COLONY No. 5.

Culture of the 6th generation from Colony No. 5, was used on November 12, 1907, when 10 days old, for inoculating:—

CALF 1309.

Subcutaneous.
Dose: 44·0 mg.
Died: Dec 12, 1907.
30 days.

P.M—Acute general tuberculosis.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1562	Intrav	1·0 mg.	D. 16 days	Acute G.T.
1561	Intrav.	0·01 mg.	D. 42 ,,	G.T.

MAY 1, 1908.					
Culture derived from a lung tubercle from Rabbit 1516.	1842	Intrav.	0·1 mg.	D. 40 days	Slight T. of lungs and a kidney.
	1843	Intrav.	0·01 mg.	K. 152 ,,	Slight T. of lungs and a kidney. T. of one knee joint.
APRIL 24, 1908.					
Culture derived from a lung tubercle from Rabbit 1519.	1830	Intrav.	0·1 mg.	K. 137 days	T. of lungs, kidneys, and mamma, not apparently progressive.
	1831	Intrav.	0·01 mg.	K. 137 ,,	Slight T. of lungs and kidneys.
APRIL 24, 1908.					
Culture derived from a lung tubercle from Rabbit 1521.	1832	Intrav.	0·1 mg.	D. 134 days	Chronic G.T. (no evidence of presence of bacilli of Group I.).
	1833	Intrav.	0·01 mg.	D. 3 ,,	No T.

TABLE E.

VIRUS H 13. "A.D."

CULTURE DERIVED FROM CALF 301 (THORACIC GLAND).

INVESTIGATION OF SEPARATE COLONIES.

A large wrinkled colony (Colony 11) on a glycerin-serum plate sown from Guinea-pig 2491, 52 days old, was emulsified and inoculated into a rabbit and a guinea-pig on Sept. 19, 1907.
(G.P. 2491 was inoculated with a single colony from an egg tube, the 25th generation from Calf 301.)

RABBIT 1506.
Subcutaneous.
Killed after 92 days.
Severe general tuberculosis.

GUINEA-PIG 2605.
Intraperitoneal.
Killed : Oct. 14, 1907.
25 days.
General tuberculosis.

Experiments with cultures raised in ordinary way.

RABBIT 1538.
Intravenous.
Emulsion of omentum of Guinea-pig 2605.
Died : 28 days.
General miliary tuberculosis

CULTURE.

The strain was derived from the spleen of the guinea-pig, and had been raised and maintained on glycerin-serum. The 4th generation of culture was used, on Dec. 9, 1907, when 8 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1586	Intrav.	1·0 mg.	D. 25 days	General miliary T.
1587	Intrav.	0·1 mg.	D. 38 ,,	G.T.
1588	Intrav.	0·01 mg.	D. 67 ,,	G.T.
1589	Subcut.	50·0 mg.	D. 115 ,,	G.T. and pseudo-tuberculosis.

GUINEA-PIG 2839.
Subcutaneous.
Dose : 1·0 mg.
Died : 19 days.
Early G.T.

CULTURE.

The strain was derived from the inguinal gland. The 6th generation of culture was used, on April 9, 1908, when 24 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1820	Intrav.	1·0 mg.	D. 21 days	General miliary T.
1821	Subcut.	122·0 mg.	D. 117 ,,	G.T.

CULTURE.

The strain was derived from the omentum of the guinea-pig, and had been raised and maintained on glycerin-serum. The 5th generation of culture was used, on Dec. 17, 1907, when 9 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1599	Intrav.	1·0 mg.	D. 24 days	General miliary T.
1600	Intrav.	0·1 mg.	D. 27 ,,	G.T.

Experiments with cultures raised from single colonies.

CULTURE.

A single colony was isolated from a serum-agar plate sown from the omentum of the guinea-pig, and subcultivated on serum. The 7th generation of culture was used, on March 17, 1908, when 21 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1778	Intrav.	1·0 mg.	D. 32 days	G.T.
1779	Intrav.	0·01 mg.	K. 192 ,,	Slight T. of lungs and kidneys.
1777	Subcut.	84·0 mg.	D. 124 ,,	Local lesion and slight T. of lungs and kidneys. Death from an acute infection.

CULTURE.

Animals inoculated on Jan. 16 and 17, 1908, with cultures derived from separate colonies taken from a glycerin-serum plate sown from the omentum of the guinea-pig.

RABBITS.

Number.	Method.	No. of Colony.	Dose.	Duration of Life.	Result.
1676	Intrav.	Col. 4	0·1 mg.	D. 18 days	G.T.
1675	,,	,,	0·01 mg.	D. 28 ,,	G.T.
1672	Intrav.	Col. 6	1·0 mg.	D. 69 ,,	T. of lungs and kidneys.
1671	,,	,	0·1 mg.	K. 119 ,	Slight T. of lungs and kidneys.
1678	Intrav.	Col. 7	1·0 mg.	D. 104 ,,	T. of lungs and kidneys.
1679	,,	,,	0·01 mg.	K. 119 ,,	Slight T. of lungs and a kidney.
1673	Intrav.	Col. 8	0·1 mg.	D. 106 ,,	General progressive T.
1674	,,	,,	0·01 mg.	K. 119 ,,	G.T. not severe · apparently progressive.
1680	Intrav.	Col. 9	1·0 mg.	K. 119 ,,	T. of lungs and kidneys.
1679	,,	,,	0·01 mg.	K. 119 ,,	T. of lungs only.
1682	Intrav.	Col. 10	1·0 mg.	D. 17 ,,	G.T.
1681	,,	,,	0·01 mg. (+0·02 mg subcut).	D. 46 ,,	G.T.

CALF 1343.
Subcutaneous.
Culture from Colony 6.
Dose : 78·0 mg.
Killed : April 9, 1908.
84 days.
P.M.—Local tuberculosis : one tubercle in lung and a minute focus in a bronchial gland.

CALF 1337.
Subcutaneous.
Culture from Colony 7.
Dose : 59·0 mg.
Killed : April 2, 1908.
76 days.
P.M.—Local tuberculosis : one minute focus in a bronchial gland.

TABLE F.

VIRUS H 13. "A.D."

CULTURE DERIVED FROM CALF 301 (THORACIC GLAND).

INVESTIGATION OF SEPARATE COLONIES.

CULTURE.

Ten single colonies were removed from an egg tube sown from the prescapular gland of Calf 1175 (inoculated with 100·0 mg. of culture from Calf 301).

The growth from one serum tube of the 3rd generation of each of the ten strains was inoculated into a Rabbit on August 21, 1907.

RABBITS.

Number.	Method.	No. of Colony.	Dose.	Duration of Life.	Result.
1461	Subcut.	Col. 1	1 serum tube	D. 16 days	Local T. Cysticercosis.
1462	Subcut.	Col. 2	,,	D. 5 ,,	No T. Cause of death not determined.
1463	Subcut.	Col. 3	,,	D. 16 ,,	Local T. Cause of death not determined.
1464	Subcut.	Col. 4	,,	D. 55 ,,	G.T.
1465	Subcut.	Col. 5	,,	D. 81 ,,	G.T.
1466	Subcut.	Col. 6	,,	K. 110 ,,	Chronic G.T.
1467	Subcut.	Col. 7	,,	D. 3 ,,	Slight pseudo-tuberculosis ; ? cause of death.
1468	Subcut.	Col. 8	,,	D. 67 ,,	G.T.
1469	Subcut.	Col. 9	,,	K. 110 ,,	Chronic G.T., apparently retrogressive
1470	Subcut.	Col. 10	,,	D. 49 ,,	G.T.

GUINEA-PIG 2621.

Inoculated on October 11, 1907, with culture from the mediastinal gland of Calf 1175 (inoculated with 100·0 mg. of culture from Calf 301). The culture used was the 5th generation, 70 days old, on glycerin serum.

The guinea-pig was killed after 26 days, and showed general tuberculosis.

CULTURES.

Six colonies were isolated from glycerin-serum tubes sown from the guinea-pig, separately cultivated on serum, and inoculated into Rabbits.

RABBITS.

Date.	Number.	Method.	No. of Colony.	Age and Generation	Dose.	Duration of Life.	Result.
March 30, 1908.	1787	Intrav.	Col. 1	5th gen., 14 days old	0·1 mg.	D. 51 days	G.T.
	1788	Intrav.	,,	,, ,,	0·01 mg.	D. 98 ,,	G.T.
	1789	Intrav.	Col. 2	5th gen., 14 days old	0·1 mg.	D. 161 ,,	G.T. (progressive in thorax).
	1790	Intrav.	,,	,, ,,	0·01 mg.	K. 162 ,,	T. of mammary glands and slight T. of lungs.
	1791	Subcut.	Col. 3	5th gen., 14 days old	Culture had agglutinated and was not estimated.	D. 56 ,,	Slight G.T.
	1792	Subcut.	Col. 4	5th gen., 14 days old	Growth from 2 serum tubes.	D. 41 ,,	Local T., T. of lungs, and three nodules in the kidneys.
May 11, 1908.	1849	Subcut.	Col. 5	4th gen., 20 days old	Growth from 1½ serum tubes.	D. 65 ,,	G.T.
	1850	Subcut.	Col. 6	4th gen., 20 days old	Growth from 1½ serum tubes.	D. 66 ,,	G.T.

A culture was obtained in the ordinary way from a glycerin-serum tube sown from the spleen of the guinea-pig, maintained on glycerin serum for 162 days, and then inoculated into Rabbits.

The 6th generation of culture, 17 days old, was used.

RABBITS.

Number.	Method.	Dose.	Duration Life.	Result.
1827	Subcut.	Growth from one G.S. tube.	D. 105 days	Slight G.T.
1828	Subcut.	Do. (larger)	D. 109 ,,	G.T.

TABLE G.

VIRUS H 49. "T.C."

CULTURE DERIVED FROM THE MESENTERIC GLANDS (ROYALCOT STRAIN).

CULTURE INOCULATIONS.

(*a*) PRELIMINARY TEST.

The strain was derived from the original material, and had been in cultivation a total period of 1 year 10½ months,

The 25th generation of culture was used on Feb. 19, 1907, when 21 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1180	Intrav.	1·0 mg.	D. 16 days	G.T.
1181	Intrav.	0·1 mg.	D. 31 "	General miliary T.
1182	Intrap.	1·0 mg.	K. 163 "	Chronic G.T. (Injection intra-caecal.)

RABBITS inoculated with emulsion of lung from Rabbit 1181.

Number.	Method.	Duration of Life.	Result.
1219	Subcut.	D. 74 days	G.T.
1220	Subcut.	D. 82 "	G.T.

(*b*) REPEAT TEST.

The strain had been in artificial cultivation a total period of 2 years 11 months.

The 36th generation of culture was used on Jan. 30, 1908, when 7 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1708	Intrav.	1·0 mg.	D. 19 days	G.T.
1706	Intrav.	0·1 mg.	D. 31 "	Severe G.T.
1707	Intrav.	0·1 mg.	D. 24 "	G.T.
1709	Subcut.	20·0 mg.	D. 117 "	G.T.

TABLE H.

VIRUS H 49. "T.C."

CULTURE DERIVED FROM THE MESENTERIC GLANDS (ROYALCOT STRAIN)

SEPARATION BY ANIMAL INOCULATION.

CULTURE.

The strain was derived from the original material, and had been in artificial cultivation a total period of 2 years 2 weeks.
The 29th generation of culture was used on April 20, 1907, when 25 days old.

CALF 1213.
Subcutaneous.
Dose : 50·0 mg.
Killed when in moderate health
July 9, 1907.
80 days.
P.M. — General progressive tuberculosis of a chronic type.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1264	Intrav.	1·0 mg.	D. 19 days	G.T.
1265	Intrav.	0·1 mg.	D. 30 „	G.T.
1266	Subcut.	47·0 mg.	K. (ill) 54 days	G.T.
1267	Subcut.	10·0 mg.	D. 104 days	G.T.

CALF 1263.
Subcutaneous.
Dose : 10·0 cc. of emulsion of prescapular gland (T.B. fairly numerous).
Killed : Oct. 8, 1907.
91 days.
P.M.—Chronic general tuberculosis, not severe.

RABBITS.

—	Number.	Method.	Dose.	Duration of Life.	Result.
E. of prescapular gland.	1378	Subcut.	4·0 cc.	D. 52 days	G.T.
	1379	Subcut.	4·0 cc.	K. 78 „	G.T.
E. of mediastinal gland.	1376	Subcut.	—	D. 122 „	G.T.
	1377	Subcut.	—	D. 86 „	G.T.

CULTURE.

The strain was derived from the mediastinal gland, and had been in artificial cultivation a total period of 83 days. The 6th generation of culture was used on Dec. 30, 1907, when 21 days old.

RABBITS.

—	Number.	Method.	Duration of Life.	Result.
E. of prescapular gland.	1536	Subcut.	D. 232 days	Chronic progressive tuberculosis.
E. of portal gland.	1537	Subcut.	D. 2 „	No T. (?) cause of death.

CALF 1347.
Subcutaneous.
Dose : 50·0 mg.
Killed when ill : Feb. 20, 1908.
52 days.
P.M. — General tuberculosis, severe.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1618	Subcut.	10·0 mg.	D. 74 days	G.T.
1619	Subcut.	7·3 mg.	D. 78 „	G.T.

TABLE I.

VIRUS H 49. "T.C."

CULTURE DERIVED FROM THE MESENTERIC GLANDS (ROYALCOT STRAIN).

INVESTIGATION OF SEPARATE COLONIES.

CALF 1213.

Inoculated subcutaneously with
50·0 mg. of culture derived from
the mesenteric glands.
Killed, July 9, 1907 (80 days).

CULTURE.

Twelve single colonies were isolated from an egg tube sown from the prescapular gland of Calf 1213, and separately subcultivated. The growth from one serum tube of the 3rd generation of each of the 12 strains was inoculated into a Rabbit, on August 23, 1907.

RABBITS.

Number.	Method.	No. of Colony.	Duration of Life.	Result.
1481	Subcut.	Col. 1	K. 108 days	Gen. progressive T., severe in lungs.
1482	Subcut.	Col. 2	D. 36 ,,	G. miliary T.
1483	Subcut.	Col. 3	D. 38 ,,	G.T.
1484	Subcut.	Col. 4	D. 35 ,,	G.T.
1485	Subcut.	Col. 5	D. 38 ,,	G.T.
1486	Subcut.	Col. 6	D. 72 ,,	G.T.
1487	Subcut.	Col. 7	D. 91 ,,	G.T.
1488	Subcut.	Col. 8	D. 82 ,,	G.T.
1489	Subcut.	Col. 9	K. 108 ,,	Gen. progressive T., not very severe.
1490	Subcut.	Col. 10	K. 108 ,,	Gen. progressive T., not very severe.
1491	Subcut.	Col. 11	D. 25 ,,	G.T.
1492	Subcut.	Col. 12	D. 23 ,,	Gen. miliary T.

TABLE J.

VIRUS H 49. "T.C."

CULTURE DERIVED FROM THE MESENTERIC GLANDS (ROYALCOT STRAIN).

INVESTIGATION OF SEPARATE COLONIES.

GUINEA-PIG 2490.

Inoculated intraperitoneally on July 4, 1907, with the growth from a glycerin-agar culture, 56 days old, the 11th generation from the original material.

The guinea-pig was killed 25 days later and showed general tuberculosis.

CULTURES.

Eleven colonies were removed from a glycerin-serum plate sown from the sternal gland of Guinea-pig 2490, and separately cultivated.

RABBITS inoculated with Cultures derived from these Colonies.

Date of Inoculation.	No. of Colony.	Age and Generation.	Number of Rabbit.	Method.	Dose.	Duration of Life.	Result.
October 15, 1907.	Col. 1	Each received one glycerin-serum culture, 2nd generation, 26 days old.	1539	Subcut.	Large	K. 98 days	Local lesion and slight T. of lungs.
	Col. 2		1540	Subcut.	Large	K. 98 ,,	Local T. Miliary tubercles in lungs. One tubercle in kidney.
	Col. 3		1541	Subcut.	Large	K. 94 ,,	Local lesion. Slight T. of lungs and kidneys.
	Col. 4		1542	Subcut.	Small	K. 99 ,,	Local lesion. Slight T. of lungs.
	Col. 5		1543	Subcut.	Small	K. 99 ,,	Local lesion. ? one or two tubercles in lungs.
	Col. 6		1544	Subcut.	Small	K. 99 ,,	Local T. and slight T. of lungs.
January 14, 1908.	Col. 7	6th gen., 27 days old.	1663	Subcut.	2 serum cultures.	K. 106 ,,	Local T. and T. of lungs.
January 11, 1908.	Col. 8	6th gen., 24 days old, on serum.	1648	Intrav.	1·0 mg.	K. 109 ,,	Fairly extensive miliary T. of lungs and kidneys.
			1647	Intrav.	0·1 mg.	K. 109 ,,	Slight T. of lungs and kidneys.
	Col. 9	6th gen., 24 days old, on serum.	1650	Intrav.	1·0 mg.	K. 109 ,,	Miliary T. of lungs and kidneys (not severe).
			1649	Intrav.	0·1 mg.	K. 109 ,,	Slight T. of lungs and kidneys.
January 14, 1908.	Col. 11	7th gen., 14 days old.	1664	Subcut.	2 serum cultures.	K. 106 ,,	Local T. and slight T. of lungs.

Cultures raised from Colonies 1, 2, and 3, were retested.

Date of Inoculation.	No. of Colony.	Age and Generation.	Number of Rabbit.	Method.	Dose.	Duration of Life.	Result.
January 27, 1908.	Col. 1	6th gen., 5 days old.	1700	Intrav.	1·0 mg.	D. 21 days	Minute tubercles in lungs and kidneys. T.B. in spleen.
			1699	Intrav.	0·1 mg.	K. 110 ,,	T. of lungs (severe) and kidneys.
	Col. 2	7th gen., 5 days old.	1702	Intrav.	1·0 mg.	K. 110 ,,	T. of lungs, kidneys, portal gland, and mamma.
			1701	Intrav.	0·1 mg.	K. 110 ,,	T. of lungs, kidneys, and mamma.
	Col. 3	7th gen., 5 days old.	1704	Intrav.	1·0 mg.	K. 110 ,,	T. of lungs, kidneys, and mamma.
			1703	Intrav.	0·1 mg.	K. 110 ,,	

CULTURE.

A culture was raised from the scapular gland of Rabbit 1544.

The 3rd generation, 13 days old, was used for inoculation on March 13 1908.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1762	Intrav.	1·0 mg.	D. 17 days	G.T.
1763	Intrav.	0·01 mg.	K. 91 ,,	Slight T. of lungs only.

COLONY 9.

Culture of the 4th generation from Colony No. 9, on potato, was used when 40 days old for inoculating .

GUINEA-PIG 2816.

Intraperitoneal.

Killed 16 days later, and showed early general tuberculosis.

CULTURE.

A culture from the spleen was isolated and maintained on glycerin-serum.

Rabbits were inoculated on January 15, 1908, with cultures of the 3rd generation, 9 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1669	Intrav.	1·0 mg.	D. 79 days	T. of lungs and kidneys.
1668	Intrav.	0·1 mg.	K. 120 ,,	A few tubercles in the lungs.
1670	Subcut.	19·0 mg.	K. 120 ,,	Local lesion and slight T. of lungs.

A culture was raised on serum from the sternal gland of the guinea-pig. To control the results obtained with separate colonies, a series of rabbits was inoculated on February 19, 1908, with this culture (4th generation, 12 days old, on serum).

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1737	Intrav.	1·0 mg.	D. 98 days	T. of lungs and kidneys.
1735	Intrav.	0·1 mg	K. 114 ,,	Slight T. of lungs and kidneys.
1736	Intrav.	0·1 mg.	K. 114 ,,	
1738	Subcut	50·0 mg.	D. 84 ,,	Local T., and T. of lungs (rather severe).

TABLE K.

VIRUS H 49. "T.C."

CULTURE DERIVED FROM THE MESENTERIC GLANDS (ROYALCOT STRAIN).

INVESTIGATION OF SEPARATE COLONIES.

GUINEA-PIG 2918.

Inoculated intraperitoneally on Jan. 25, 1908, with the growth from an egg tube, the 35th generation of the original strain.

The guinea-pig died 14 days later, and showed acute general tuberculosis.

CULTURES.

Single colonies were removed from glycerin-serum media sown from the sternal gland, and sub-cultivated on serum.

May 13, 1908.

CALF 1387.
Subcutaneous.
Culture derived from
Colony 3.
Dose: 50·0 mg.
Died: July 10, 1908.
58 days.

P.M.—General tuberculosis.

May 18, 1908.

CALF 1415.
Subcutaneous.
Culture derived from
Colony 7.
Dose: 50·0 mg.
Killed: Aug. 28, 1908.
102 days.

P.M.—Local tuberculosis only.

The local tumour consisted of a fibrous capsule enclosing caseous and softened material.

The left prescapular gland was dense and caseous; one prepectoral gland contained a fibro-calcareous nodule.

CALF 1413.
Subcutaneous.
Culture derived from
Colony 17.
Dose: 50·0 mg.
Killed: Sept. 2, 1908.
107 days.

P.M.—Slight generalised tuberculosis.

Small local tumour, partly cystic, partly fibro-calcareous. Prescapular gland dense caseous and gritty throughout. Lungs showed not very numerous fibro-calcareous nodules up to a hempseed. There were scattered calcareous tubercles in spleen, eight in liver. The thoracic glands were beset with calcareous tubercles, and several other lymph glands each contained one or more

November 12, 1908.

CALF 1501.
Subcutaneous.
Culture derived from
Colony 17.
Dose: 48·0 mg.
Died: Dec. 27, 1908.
45 days.

P.M.—General tuberculosis.

RABBITS.

Date.	Number of Colony.	Age and Generation of Culture.	Number.	Method.	Dose.	Duration of Life.	Result.
May 13, 1908	Colony 3	5th gen., 7 days old.	1851	Intrav.	0·1 mg.	D. 27 days	Gen. miliary T.
			1852	Intrav.	0·1 mg.	D. 25 „	G.T.
			1853	Intrav.	0 01 mg.	D. 27 „	Gen. miliary T.
Aug. 5, 1908	Colony 5	8th gen., 18 days old.	1960	Intrav.	1 0 mg.	K. 118 days	Slight T. of lungs and kidneys.
			1961	Intrav.	0 1 mg.	K. 118 „	Slight T. of lungs, kidneys, and one mamma.
			1962	Intrav.	0·01 mg	K. 118 „	Slight T. of lungs and kidneys.
May 18, 1908	Colony 7	5th gen., 12 days old.	1863	Intrav.	0·1 mg.	K. 152 days	Very slight T. of lungs and kidneys.
			1864	Intrav.	0·01 mg.	K. 152 „	T. of lungs and one knee joint.
			1865	Intrav.	0·01 mg.	K. 102 „	Slight T. of lungs.
May 13, 1908	Colony 13	5th gen., 7 days old.	1854	Intrav.	0·1 mg.	D. 22 days	Gen. miliary T.
			1855	Intrav.	0·1 mg.	D. 22 „	Gen. miliary T.
			1856	Intrav.	0·01 mg.	D. 76 „	G.T.
May 18, 1908	Colony 17	6th gen., 7 days old.	1860	Intrav	0·1 mg.	D. 15 days	G.T.
			1861	Intrav.	0·01 mg.	D. 25 „	G.T.
			1862	Intrav.	0·01 mg.	D. 28 „	Gen. miliary T.

TABLE L.

VIRUS H 60. "W.B."

CULTURE DERIVED FROM THE BRONCHIAL GLANDS.

Separation by Animal Inoculation.

(*a*) June 15, 1906.

The strain was derived from the bronchial glands through Guinea-pig 1825, and had been in cultivation a total period of 72 days.

The culture used was the 3rd generation, 21 days old.

CALF 1099.

Subcutaneous.
Dose : 50·0 mg.
Killed when dying : July 13, 1906.
28 days.
P.M. — General tuberculosis, severe.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
907	Intrap.	10·0 mg.	K.D. 28 days	G.T.
908	Intrap.	1·0 mg.	D. 33 „	G.T.
909	Intrap.	0·1 mg.	D. 83 „	Chronic progressive T. Injection probably subcut. to a slight extent.

(*b*) August 3, 1906.

Total duration of artificial cultivation : 121 days.

The culture used was the 4th generation, 23 days old.

CALF 1107.

Subcutaneous.
Dose : 10·0 mg.
Died : Sept. 30, 1906.
58 days.
P.M.—General tuberculosis, severe.

CALF 1109.

Subcutaneous.
Dose : 10·0 mg.
Died : Sept. 4, 1906.
32 days.
P.M.—General tuberculosis, severe.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
933	Intrap.	1·0 mg.	D. 36 days	G.T.
934	Intrap.	0·1 mg.	K. (ill) 118 days	Chronic G.T.
935	Intrap.	0·1 mg.	D. 82 days	G.T.
936	Intrap.	0·01 mg.	D. 96 „	G.T.

TABLE M.

VIRUS H 60. W.B.

Culture derived from the Human Bronchial Gland through Guinea-pig 1825.

SEPARATION BY ANIMAL INOCULATION.

RABBIT 935.
Intraperitoneal.
August 3, 1906.
Dose : 0·1 mg. of culture derived from Guinea-pig 1825.
Died : 82 days. G.T.

CULTURE.

A single colony from a glycerin-serum tube sown from Rabbit 935 was emulsified and inoculated on Nov. 23, 1906, when 31 days old, into :

RABBIT 1017.
Intraperitoneal.
Died : 32 days. G.T.

CULTURE.

A single colony from a glycerin-serum tube sown from Rabbit 1017 was emulsified and inoculated on Jan. 29, 1907, when 35 days old, into :

RABBIT 1121.
Subcutaneous.
Died : 112 days. G.T.

INVESTIGATION OF A SINGLE COLONY ON GLYCERIN-SERUM.

The first 3 generations of culture were on serum; the fourth was sparsely sown on glycerin-serum. One of the four or five colonies which appeared was removed, cultivated on glycerin-agar, and then on serum. The serum culture was used for inoculation on Sept. 26, 1906, when 21 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
949	Intrap.	1·0 mg.	D. 31 days	G.T.
950	Intrap.	1·0 mg.	K. 103 „	G.T. Injection probably partly intracaecal.

CULTURE.

A single colony from a glycerin-serum tube sown from Rabbit 949 was emulsified and inoculated on Nov. 23, 1906, when 27 days old, into :

RABBIT 1018.
Intraperitoneal.
Died : 30 days. Acute miliary T.

CULTURE.

A single colony from a glycerin-serum tube sown from Rabbit 1018 was emulsified and inoculated on Jan. 29, 1907, when 36 days old, into :

RABBIT 1120.
Subcutaneous.
Died : 246 days. Chronic G.T.

Control Experiment.

The 6th generation of culture on serum was used for inoculation on Sept. 26, 1906, when 21 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
951	Intrap.	1·0 mg.	K. 103 days	G.T. Injection partly intra caecal.
952	Intrap.	1·0 mg.	D. 35 „	G.T.

TABLE N.

VIRUS H 60. "W.B."

CULTURE DERIVED FROM THE HUMAN BRONCHIAL GLAND THROUGH GUINEA-PIG 1825.

TESTED AFTER GROWTH ON GLYCERIN MEDIA.

CULTURE INOCULATIONS.

(*a*).

The strain had been 310 days in artificial cultivation; the 10th generation, on glycerin-serum, was used on February 8, 1907, when 20 days old (the 5th generation was on glycerin agar, the others were on serum.)

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1163	Intrap.	Growth from ½ culture tube each.	D. 128 days.	G.T.
1164	,,		D. 109 ,,	G.T.

(*b*).

The strain had been 356 days in artificial cultivation; the 14th generation, on serum, was used on March 26, 1907, when 14 days old (the 5th and 10th generations were on glycerin agar.)

CALF 1203.

Subcutaneous.
Dose: 48·0 mg.
Killed: July 1, 1907.
97 days.

P.M.—Cystic tumour. Caseo-calcareous nodules in prescapular gland. In the lungs there were small scattered grey tubercles, the larger with calcareous centres, and in the spleen similar but rather larger tubercles. The thoracic glands showed fairly numerous calcareous tubercles: one or more were seen in several other glands.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1228	Intrav.	1·0 mg.	D. 24 days	G.T.
1229	Intrav.	0·1 mg.	D. 37 ,,	G.T.
1230	Intrap.	1·0 mg.	D. 22 ,,	G.T.
1231	Subcut.	1·0 mg.	D. 170 ,,	G.T.

RABBITS.

—	No.	Method.	Duration of Life.	Result.
E. of bronchial gland.	1363	Subcut.	D. 111 days	G.T.
E. of prescapular gland.	1364	Subcut.	D. 1 day	No T.
	1365	Subcut.	D. 138 days	Chronic G.T.

CULTURES FROM CALF 1203.

Twelve single colonies from an egg tube sown from the prescapular gland of Calf 1203 were separately cultivated on serum.

The growth from one serum tube of the 3rd generation of each of the 12 strains was inoculated into a Rabbit on Aug. 20, 1907.

RABBITS.

Number.	Method.	Number of Colony.	Duration of Life.	Result.
1449	Subcut.	Col. 1	K. 120 days	Chronic G.T.
1450	Subcut.	Col. 2	K. 120 ,,	Chronic G.T.
1451	Subcut.	Col. 3	D. 88 ,,	G.T.
1452	Subcut.	Col. 4	D. 111 ,,	G.T.
1453	Subcut.	Col. 5	D. 72 ,,	G.T.
1454	Subcut.	Col. 6	D. 15 ,,	Death from pneumonia
1455	Subcut.	Col. 7	K. 120 ,,	Chronic G.T.
1456	Subcut.	Col. 8	D. 110 ,,	G.T.
1457	Subcut.	Col. 9	K. 120 ,,	Chronic G.T.
1458	Subcut.	Col. 10	D. 97 ,,	G.T.
1459	Subcut.	Col. 11	D. 61 ,,	G.T.
1460	Subcut.	Col. 12	D. 83 ,,	G.T.

TABLE O.

VIRUS H 60. "W.B"

Culture derived from the Human Bronchial Gland through Guinea-pig 1825.

INVESTIGATION OF SEPARATE COLONIES.

CULTURE.

Ten single colonies isolated from a glycerin-serum plate sown with an emulsion of a subculture (19th generation) of the original culture were separately cultivated on serum.

The growth from one serum tube of the 2nd generation of each of the 10 strains was inoculated into a Rabbit, on Aug. 9, 1907.

RABBITS.

Number.	Method.	Number of Colony.	Duration of Life.	Result.
1417	Subcut.	Col. 1	D. 106 days	G.T.
1418	Subcut.	Col. 2	D. 99 „	G.T.
1419	Subcut.	Col. 3	K. 119 „	Slight retrogressive G.T.
1420	Subcut.	Col. 4	K. 120 „	Chronic G.T., apparently progressive.
1421	Subcut.	Col. 5	D. 7 „	No apparent cause of death.
1422	Subcut.	Col. 6	D. 3 „	Coccidiosis of liver
1423	Subcut.	Col. 7	D. 115 „	G.T.
1424	Subcut.	Col. 8	D. 9 „	Coccidiosis of liver.
1425	Subcut.	Col. 9	K. 120 „	Chronic G.T., probably progressive.
1426	Subcut.	Col. 10	D. 103 „	G.T.

GUINEA-PIG 2489.

Inoculated intraperitoneally on July 4, 1907, with a serum culture of the 17th generation from Guinea-pig 1825. The guinea-pig was killed 16 days later and showed early general tuberculosis.

CULTURES.

Six single colonies isolated from a glycerin-serum plate sown from Guinea-pig 2489 were separately cultivated.

The growth from one glycerin-serum culture of the 2nd generation of each of the 6 strains was inoculated into a rabbit, on Oct. 8, 1907.

RABBITS.

Number.	Method.	Number of Colony.	Dose.	Duration of Life.	Result.
1530	Subcut.	Col. 1	Large dose	K. 99 days	Local lesion. Slight T. of lungs.
1531	Subcut.	Col. 2	Medium ,	D. 11 „	Local lesion. (?) cause of death.
1532	Subcut.	Col. 3	Medium „	K. 99 „	Local lesion only.
1535	Subcut.	Col. 4	Large „	D. 96 „	G.T.
1534	Subcut.	Col. 5	Large „	D. 53 „	G.T.
1533	Subcut.	Col. 6	Small „	K. 99 „	Chronic G.T.

The cultures raised from Colonies 1, 2, and 5 were re-tested on Dec. 19, 1907, with estimated doses. The 16th generation of culture on serum was used in each case, when 27 days old.

1601	Intrav.	Col. 1	0·1 mg.	K. 128 days	T. of lungs, and kidneys (slight).
1602	Intrav.	„	0·01 mg.	K. 128 „	Slight T. of lungs.
1603	Intrav.	Col. 2	0·1 mg.	K. 128 „	Slight T. of lungs and kidneys.
1604	Intrav.	„	0·01 mg.	K. 128 „	One tubercle in the right kidney only.
1605	Intrav.	Col. 5	1·0 mg.	D. 42 „	G.T.
1606	Intrav.	„	0·01 mg	D. 67 „	G.T.

GUINEA-PIG 2817.

Inoculated intraperitoneally on Dec. 2, 1907, with a culture on potato of the 5th generation from Colony No. 1. The guinea-pig was killed 14 days later, and showed early general tuberculosis.

CULTURE.

A culture was obtained from the spleen of the guinea-pig. It was isolated and maintained on glycerin-serum. The 3rd generation was used when 7 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1656	Intrav.	1·0 mg.	D. 73 days	Scattered miliary tubercles in lungs. Death from intestinal obstruction.
1657	Intrav.	0·01 mg.	K. 121 „	Slight T. of lungs only.
1658	Subcut.	50·0 mg.	K. 121 „	Local lesion and slight T. of lungs.

July 30, 1908.

Inoculations with a serum culture derived from Colony 1.

CALF 1481.

Subcutaneous.

Dose . 50·0 mg.

Killed: Nov. 3, 1908.

96 days.

P.M.—Fibro-caseous and softened local tumour; fibro-caseo-calcareous nodules in left prescapular gland: seven grey tubercles in lungs, and a few calcareous grains in one ileo-colic gland.

RABBITS.

Number	Method.	Dose.	Duration of Life.	Result.
1946	Subcut.	7·7 mg.	K. 161 days	Local lesion and slight T. of lungs.
1947	Subcut.	10·0 mg.	K. 161 „	Local lesion and slight T. of lungs and kidneys.

July 30, 1908.

Inoculations with a serum culture derived from Colony 5.

CALF 1425.

Subcutaneous.

Dose : 50·0 mg.

Killed when dying : Sept. 14, 1908.

46 days.

P.M.—General tuberculosis.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1949	Subcut.	1·0 mg.	D. 155 days	Chronic G.T.
1948	Subcut.	1·0 mg.	D. 49 „	G.T. not severe.

TABLE P.

VIRUS H 90. "I.P."

CULTURE DERIVED FROM THE RETROPERITONEAL GLAND.

Separation by Animal Inoculation (Calves).

CULTURE.

Derived from the retroperitoneal gland direct: the 21st generation of culture on serum was inoculated on July 8, 1908, when 16 days old; total duration of artificial cultivation: 340 days

CALF 1383.
Subcutaneous.
Dose: 50·0 mg.
Killed: October 8, 1908.
92 days.

P.M.—General tuberculosis progressive, but not severe.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1923	Subcut.	10·0 mg.	K. 296 days	Slight G.T.
1924	Subcut.	10·0 mg.	K. 296 "	Chronic general progressive T.

CALF 1471.
Subcutaneous.
Dose. 80·0 mg.
Killed: October 6, 1908.
90 days.

P.M.—Slight progressive tuberculosis. Small ulcerated tumour at seat of inoculation; scattered caseo-purulent nodules in adjacent glands. About half-a-dozen perlsucht growths up to 8 mm., the majority in an early stage, were seen in the surface of the lungs, in the substance were scattered small reddish nodules. The spleen contained a dozen gritty tubercles, the thoracic glands scattered calcareous tubercles.

CULTURE.

The strain was derived from the pudic gland, and had been 48 days in artificial cultivation. The 4th generation of culture was used for inoculation on November 25, 1908, when 12 days old.

CALF 1489.
Subcutaneous.
Dose: 50·0 mg.
Died: January 6, 1909.
42 days.

P.M.—General tuberculosis.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
2070	Subcut.	10·0 mg.	D. 51 days	G. T.
2071	Subcut.	1·0 mg.	D. 78 "	G. T.

CULTURE.

The strain was derived from the bronchial gland, and had been 48 days in artificial cultivation. The 3rd generation of culture was used for inoculation on November 23, 1908, when 20 days old.

RABBIT 2069.
Subcutaneous.
Dose: 1·0 mg.
Died in 48 days.

P.M.—General tuberculosis.

CALF 1493.
Subcutaneous.
Dose: 45·0 mg.
Died: December 14, 1908.
21 days

P.M.—General tuberculosis.

TABLE Q.

VIRUS H 90. "I.P."

CULTURE DERIVED FROM THE RETROPERITONEAL GLAND.

Separation by Animal Inoculation (Rabbits).

I.—November 5, 1907.

The strain was derived from the human retroperitoneal gland, and had been in artificial cultivation a total period of 94 days.

The culture used was the 8th generation, 14 days old, on bovine serum.

RABBITS.

Number.	Method.	Dose	Duration of Life.	Result
1551	Intrav.	1·0 mg.	D. 26 days	G. T.
1552	Intrav.	0·1 mg.	D. 79 "	T. of lungs and kidneys.
1553	Subcut.	10·0 mg.	K. 111 "	G. T.
1554	Subcut.	10·0 mg.	K. 111 "	G. T.

April 14, 1909.

Separation Experiment on Glycerin Media

The strain was derived from the human retroperitoneal gland, and had been cultivated on glycerin-serum for four months, it was then sown on the serum and the resulting growth inoculated (33rd generation, 8 days old)

RABBITS.

Number.	Method.	Dose.	Duration of Life	Result.
2301	Intrav.	0·1 mg.	D. 19 days	General miliary T.
2300	Intrav.	0·01 mg.	D. 35 "	G.T.
2302	Intrav.	0·01 mg.	D. 28 "	General miliary T.

II.—March 30, 1908.

The strain was derived from the same source and had been in cultivation a total period of 240 days.

The culture used was the 16th generation, 13 days old, on bovine serum

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1793	Intrav.	1·0 mg.	D. 32 days	G. T.
1794	Intrav.	0·1 mg.	D. 64 "	G. T.
1795	Intrav.	0·01 mg.	D. 116 "	G. T.

CULTURE.

Derived from the lung of Rabbit 1794. Inoculated on September 4, 1908, after 94 days cultivation. The 5th generation was used when 18 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life	Result.
1992	Intrav.	0·1 mg.	D. 27 days	G. T.
1993	Intrav.	0·01 mg.	D. 28 "	G. T.
1994	Intrav.	0·01 mg.	D. 32 "	G. T.

CULTURE.

Derived from the kidney of Rabbit 1795. Inoculated on October 13, 1908, after 81 days cultivation. The 6th generation was used when 22 days old

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
2040	Intrav.	1·0 mg.	D. 14 days	Acute G. T.
2041	Intrav.	0·1 mg.	D. 21 "	General miliary T
2042	Intrav.	0·01 mg.	D. 36 "	G. T.

TABLE R.

VIRUS H 90. "I.P."

CULTURE DERIVED FROM THE RETROPERITONEAL GLAND.

Separation by Animal Inoculation (Goat).

CULTURE.

The strain was derived from the human retro-peritoneal gland, and had been in cultivation a total period of 103 days.

The 10th generation, 14 days old, on glycerin-serum, was used for inoculation on November 14, 1907.

GOAT 55.

Subcutaneous.
Dose : 50·0 mg.
Killed : February 25, 1908.
103 days.

P.M.—Small local lesion. Left prescapular gland contained caseous gritty nodules. The lungs showed fairly numerous small grey fibrous tubercles ; each kidney contained one tubercle. In most of the mesenteric glands there were soft yellow gritty tubercles and patches. The left half of the udder contained a number of fibrous tubercles with caseous centres and two hard nodules with caseous foci ; the right showed a small firm patch beset with caseous points. Supramammary lymph glands normal.

CULTURE.

The strain was derived from the prescapular gland of Goat 55, and was inoculated on December 22, 1908, after 301 days artificial cultivation. The culture used was the 13th generation, 13 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
2097	Intrav.	1·0 mg.	D. 103 days	T. of lungs, kidneys, and muscles.
2098	Intrav.	0·1 mg.	K. 136 "	A few tubercles in lungs only.
2099	Intrav.	0·1 mg.	K. 136 "	Slight T. of lungs, kidneys and inguinal glands.

Emulsion of prescapular gland into—

RABBITS.

1741	Subcut.	D 145 days	G. T.
1742	Subcut.	D. 157 "	G. T.

CULTURE.

Derived from the lung of Rabbit 1741. The 4th generation, 13 days old, was used for inoculation on September 24, 1908.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
2013	Intrav.	1·0 mg.	D. 15 days	Acute miliary T.
2014	Intrav.	0·1 mg.	D. 22 "	G. T.
2015	Intrav.	0·01 mg.	D. 27 "	General miliary T.

CULTURE.

Derived from Guinea-pig 2791, inoculated on November 28, 1907, with 10·0 cc. of milk from the right half of the udder (died in 88 days, G. T.).

The 7th generation of culture, 11 days old, was used on August 14, 1908, for inoculating—

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1967	Intrav.	1·0 mg.	K. 167 days	T. of lungs and kidneys.
1968	Intrav.	0·1 mg.	K. 167 "	Very slight T. of lungs and kidneys.
1969	Intrav.	0·01 mg.	K. 167 "	
1970	Subcut.	50·0 mg.	K. 167 "	Local lesion, T. of lungs (moderate), and of kidneys (slight).

TABLE S.

VIRUS H 90. "I.P."

CULTURE DERIVED FROM THE RETROPERITONEAL GLAND.

Investigation of Separate Colonies.

RABBIT 2019.

Inoculated intravenously with a fairly large dose of a serum culture (24th generation, 16 days old) derived from the retroperitoneal gland, on September 28, 1908.
Died of acute tuberculosis on October 18, 1908 (20 days).

CULTURE.

Single colonies were isolated from two egg tubes sown with an emulsion of spleen.

RABBITS inoculated with cultures derived from these colonies.

Date of Inoculation.	Number of Colony.	Age and Generation.	Number of Rabbit.	Method.	Dose.	Duration of Life.	Result.
Jan. 28, 1909	Col. 1	4th gen.; 21 days old, on serum.	2136	Intrav.	0·1 mg.	D. 21 days	General miliary T.
			2135	Intrav.	0·01 mg.	D. 32 „	G. T.
„	Col. 2	4th gen.; 21 days old, on serum.	2138	Intrav.	0·1 mg.	D. 21 „	General miliary T.
			2137	Intrav.	0·01 mg.	D. 33 „	G. T.
Jan. 27, 1909	Col. 5	4th gen.; 20 days old, on serum.	2134	Intrav.	0·1 mg.	K. 104 „	Slight T. of kidneys, moderately severe disease of lungs, and severe T. of eyes and lachrymal glands.
			2133	Intrav.	0·01 mg.	D. 17 „	Slight T. of lungs. Death from coccidiosis.

GUINEA-PIG 3300.

Inoculated intraperitoneally with the same culture as Rabbit 2019, on September 28, 1908.
Killed 21 days later on October 19, 1908, and showed general tuberculosis.

CULTURE.

Single colonies were isolated from an egg tube sown from the pyloric gland.

RABBITS inoculated with cultures derived from these colonies.

Date of Inoculation.	Number of Colony.	Age and Generation.	Number of Rabbit.	Method.	Dose.	Duration of Life.	Result.
Jan. 7, 1909	Col. 1	4th gen.; 19 days old, on serum.	2109	Intrav.	1·0 mg.	D. 121 days	T. of lungs and kidneys.
			2110	Intrav.	0·1 mg.	K. 170 „	Very slight T. of lungs and kidneys.
			2111	Intrav.	0·01 mg.	K. 170 „	Very slight T. of lungs.
Jan. 27, 1909	Col. 2	5th gen.; 21 days old, on serum.	2130	Intrav.	0·1 mg.	K. 104 „	Slight T. of lungs and kidneys.
			2129	Intrav.	0·01 mg.	K. 104 „	
„	Col. 3	5th gen. 21 days old, on serum.	2132	Intrav.	0·1 mg.	K. 104 „	Slight T. of lungs and kidneys.
			2131	Intrav.	0·01 mg.	K. 104 „	Slight T. of lungs only.

FULL POST-MORTEM NOTES OF THE CALVES INOCULATED.

		PAGE
Virus H 13 "A.D."	Calf 1175	50
	Calf 1177	51
	Calf 1237	52
	Calf 1327	54
	Calf 1207	55
	Calf 1301	57
	Calf 1309	58
	Calf 1337	59
	Calf 1343	60
Virus H 49. "T.C."	Calf 1191	61
	Calf 1193	61
	Calf 1213	62
	Calf 1263	64
	Calf 1347	66
	Calf 1387	67
	Calf 1415	68
	Calf 1413	69
	Calf 1501	69
Virus H 60. "W.B."	Calf 1203	71
	Calf 1481	72
	Calf 1425	73
Virus H 90. "I.P."	Calf 1489	74
	Calf 1493	75

NOTE.—The full post-mortem notes of three calves, Calves 1099, 1107 and 1109, which were inoculated to test the virulence of the bronchial gland strain from Virus H 60. "W.B.", will be found on pages 279–282 of the Report on Cases of Human Tuberculosis (other than lupus).

The full post-mortem notes of Calves 1383 and 1471, which were inoculated to test the virulence of the retroperitoneal gland strain of Virus H 90. "I.P.", together with the post-mortem notes of Goat 55, will be found on pages 460 and 461 of the same report.

CALF 1175. Virus H 13. "A.D."

Subcutaneous inoculation of culture derived from Calf 301 (thoracic gland), direct.

Dose—100·0 milligrammes.

Date of Inoculation—March 23, 1907. [Age, 13 weeks.]

Killed when in good health—June 12, 1907. [81 days after inoculation.]

Clinical Notes.

A large pendulous tumour developed at the seat of inoculation on the left side of the neck; on the 27th day this measured 18 by 9 cm. The tissues of the dewlap were slightly oedematous, and the left prescapular gland was very large, measuring 14 cm. in length. The general health of the animal was unimpaired.

Shortly afterwards the tumour opened and discharged caseo-purulent matter, subsequently diminishing in size. On the 52nd day it was firm and slightly raised, measuring 13 by 6 cm., and showing over the lower part an ulcer 4 cm. in greatest diameter, partly covered with a caseous scab. The prescapular gland was still considerably enlarged, measuring 11 cm. in length. The calf was apparently in good health.

On the 81st day the calf was killed.

Temperature.—During part of the second and third weeks the temperature was a little raised (maximum 39·3° C.); subsequently it was normal.

Tuberculin Test.—The calf was not tested subsequent to inoculation.

Weights.

	cwt.	qrs.	lbs.
March 23, 1907	1	0	14
June 12, 1907	1	3	8

Total gain of weight.—2 qrs. 22 lbs.

Average rate of gain per week—6·9 lbs.

POST-MORTEM EXAMINATION.

The carcass was in good condition.

Local Lesion.—The local lesion was firm and measured 10 by 7 by 4 cm.; it showed towards the lower extremity an oval punched-out ulcer 3·5 cm. in length with inverted edges; this ulcer communicated with a flat space in the centre of the tumour which contained a small amount of yellow tenacious caseopus; the space was surrounded by a zone of fibrous tissue, 1 cm. in greatest thickness, infiltrated with caseous streaks and foci; the muscles beneath this collapsed cavity or space were fibroid and closely beset with caseo-calcareous nodules ranging in size from a millet seed to a pea; the skin was much thickened and was adherent to the wall of the cavity.

Left Prescapular Gland.—The left prescapular gland measured 8·5 by 5 by 4·5 cm., and weighed 4 ozs.; on section it was tuberculous throughout, the greater portion being composed of dense pinkish yellow caseo-necrotic substance gritty around the periphery, the rest of caseo-calcareous tissue; the capsule was greatly thickened in places.

Right Prescapular Gland.—The right prescapular gland measured 5 by 2·3 by 1·4 cm. and showed in the cortex fairly numerous soft caseous nodules similar to those in the precrural glands (which see).

Left Prepectoral Glands.—The rounded prepectoral gland, the size of a swallow's egg, showed about half the cortex dense and caseous, while the rest was studded with caseo-calcareous tubercles.

The reniform gland was enlarged and contained a few caseous tubercles.

Cervical Glands.—One in the middle of the neck on the left side, the size of a large pea, was caseous throughout. Other cervical glands showed discrete yellow caseous nodules up to a hemp-seed in size.

A hæmolymph gland on the left side of the neck contained a soft caseous millet-seed sized tubercle.

Thorax.

Pleura.—On the costal pleura there were two hemp-seed sized tubercles, each with a minute yellow caseous centre. On the visceral pleura were two small pinkish fibrous nodules not caseous nor calcareous.

Lungs.—The lungs were crepitant throughout and showed no collapsed areas; they contained fairly numerous evenly distributed tubercles ranging in size from a mere point up to 2 mm. in diameter; the larger tubercles had yellow calcareous centres, the smaller ones were grey and homogeneous throughout. In the thin margin of one of the cephalic lobes there was a larger nodule with a caseo-calcareous centre.

Thoracic Glands.—The dorsal mediastinal and the bronchial glands were slightly enlarged and were closely beset with yellow caseo-calcareous tubercles, mainly discrete, but here and there aggregated together; the long mediastinal measured 3·3 by 2 by 2 cm.

The ventral mediastinal glands contained three or four caseous tubercles.

Heart.—On the pericardium covering the great vessels and the auricles, and along the interventricular sulci, were patches of tuberculous granulations, and here and there clusters of grey tubercles; on the surface of the ventricles there were a few isolated grey tubercles. There were a few patches of tuberculous granulations on the parietal pericardium as well as some discrete tubercles. Heart muscle and valves normal.

Larynx and Trachea.—Normal.

Abdomen.

Omentum.—On the inferior surface there were two loosely pedunculated millet-seed sized grey tubercles, each with a calcareous grain in the centre.

Peritoneum.—On the peritoneal surface of the diaphragm near the falciform ligament there was a slightly raised greyish pink nodule 1 cm. in diameter with a caseo-calcareous centre.

On the falciform ligament there were three or four small flattened caseous tubercles with grey margins.

Spleen.—The spleen was normal in size, and showed in the pulp fairly numerous evenly distributed soft yellow caseous nodules, varying in size from 1·5 to about 5 mm. in diameter; the nodules had grey fibrous margins and the larger ones were lobular in outline.

Liver.—The capsule of the liver showed three flattened grey slightly raised tubercles about 1·5 mm. in diameter, not involving the liver substance. On the anterior surface there were besides a few filmy grey fibrous tufts loosely attached to the capsule. In the substance of the liver two minute opaque points were seen, but no definite tubercles.

Portal Glands.—The portal glands, not obviously enlarged, were closely beset with discrete yellow miliary caseo-calcareous tubercles.

Coeliac Glands.—The coeliac glands were slightly enlarged, and closely beset with yellow miliary caseo-calcareous tubercles, as in the portal glands. The renal gland was similarly affected.

Kidneys.—In the cortex of the left near the surface were three, and in that of the right four, grey tubercles, the largest the size of a millet seed; two were calcareous in the centre, the others were homogeneous throughout.

Suprarenal Bodies.—Normal.

Testicles.—Normal.

Alimentary Tract.

Tongue, Pharynx, Tonsils.—Normal.

Intestines.—All the Peyer's patches showed scattered about in the lymphoid tissue soft yellow foci, mostly about the size of millet seeds ; they were most conspicuous from the serous surface, and in several places were aggregated together to form large nodules ; the mucous membrane over them was raised, and in some cases showed a small depression or pit but no actual ulcers. The large intestine was normal.

Mesenteric Glands.—All the mesenteric glands showed in the cortex fairly numerous yellow caseo-calcareous tubercles, mostly about the size of a millet seed or less, but several attaining the size of a hempseed ; they were for the most part discrete, but here and there formed irregular calcareous patches.

Ileo-colic Glands.—The ileo-colic glands were most severely affected, and their substance extensively replaced by irregular caseo-calcareous patches.

Various Lymphatic Glands.

The Precrural Glands showed in the cortex numerous soft caseous nodules, varying in size up to about 4 mm. in diameter ; the larger nodules were lobular in outline, and appeared to consist of several smaller ones united together ; no calcareous foci were detected in the caseo-pus.

The Popliteal, Gluteal, Ischiatic, Iliac, and Lumbar Glands contained similar nodules in varying number. There were similar nodules in the *Submaxillary, Retropharyngeal,* and *Parotideal Glands*, but these were generally larger, and had deeply congested margins.

Microscopical Examination.

Emulsion of Prescapular Gland.—Tubercle bacilli numerous.

Emulsion of Popliteal Gland. — Tubercle bacilli scanty.

Emulsion of Mediastinal Gland.—Tubercle bacilli scanty.

Tubercle from Intestine.—One tubercle bacillus seen.

Focus from Liver.—No tubercle bacilli seen.

Animals Inoculated.

Calf 1237 was inoculated subcutaneously with 20 cc. of emulsion made from the prescapular gland.

Rabbit 1336 was inoculated subcutaneously with the same emulsion. (Died 78 days, G.T.)

Rabbits 1337 and 1338 were inoculated subcutaneously with an emulsion made from the mediastinal gland. (Died 92 and 47 days, G.T.)

CALF 1177. Virus H 13. " A.D."

Subcutaneous inoculation of culture derived from Calf 301 (thoracic gland), direct.

Dose—50·0 milligrammes.

Date of Inoculation—March 23, 1907. [Age about 12 weeks.]

Killed when in good health—July 11, 1907. [110 days after inoculation.]

Clinical Notes.

A prominent tumour developed at the seat of inoculation on the left side of the neck.

On April 19 it measured 14 by 8 cm. The left prescapular gland was then very large—12 cm. in length ; the muscle between the tumour and the gland was slightly thickened. The calf was in good health.

On May 14 the tumour was pear shaped, measuring 14 by 7 cm. The gland was 10 cm. in length.

The calf at this time was a little thinner, and the rate of respiration seemed a little increased ; but it quickly recovered, and during the remaining eight weeks of the experiment looked well and fat.

On July 11 the tumour was found to have opened and to be discharging caseo-pus ; the calf was therefore killed on this day.

Temperature.—The temperature rose on the 10th day, reaching a maximum of 40·6° C. on the 14th day. It then slowly returned to the normal and remained normal subsequently.

Tuberculin Test.—July 5, 1907. [104 days after inoculation.] Reacted. Rise of temperature, 1·8° C.

Weights.

	cwt.	qrs.	lbs.
March 23, 1907	0	3	17
July 11, 1907	1	3	9

Total gain of weight.—3 qrs. 20 lbs.

Average rate of gain per week.—6·5 lbs.

POST-MORTEM EXAMINATION.

The carcass was in very good condition.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a firm tumour, measuring 10 by 6·5 by 4·5 cm., the skin towards the upper extremity of which showed a small opening at the bottom of a funnel shaped depression through which thick caseo-pus could be expressed.

On section the tumour was lenticular in outline (plano-convex), and was composed of a dense pinkish yellow caseous sequestrum, and a fibrous capsule from which the caseous mass was almost completely separated by thick caseo-pus ; the capsule was lined internally with a layer of granulation tissue 1·5 mm. in thickness, containing here and there calcareous grains ; the skin over the tumour was much thickened.

Left Prescapular Gland.—The left prescapular gland measured 8·2 by 5·1 by 4 cm. ; on section it was composed almost throughout of dense pinkish yellow caseous tissue, gritty around the peripheral parts ; at one extremity there was some normal-looking gland tissue which was very oedematous and contained discrete calcareous tubercles. The capsule was much thickened, especially on the convex surface.

Right Prescapular Gland.—The right prescapular gland measured 5·5 by 2·5 by 1 cm. It was oedematous (recent tuberculin inoculation) and contained scattered calcareous tubercles.

Prepectoral Glands.—On the left side one was very oedematous but free from tubercles ; two others each contained two calcareous tubercles.

Two on the right side each contained two or three calcareous tubercles.

Cervical Glands.—On the left side a midcervical gland showed a calcareous patch. Other cervical glands on this side and all those on the right contained scattered calcareous tubercles.

Thorax.

Pleura.—Normal.

Lungs.—The lungs were pinkish in colour, crepitant throughout, and collapsed normally ; they contained evenly distributed though not very numerous tubercles, ranging in size from 1 to 2 mm. in diameter ; the larger ones were yellow and calcareous with grey margins ; the smaller ones were grey and had glassy gritty centres.

Thoracic Glands.—The bronchial and mediastinal glands were slightly enlarged and showed around the cortices irregular calcareous patches, composed of aggregated tubercles, and discrete calcareous tubercles.

Ventral Mediastinal Glands.—There were a few small calcareous tubercles in each.

Heart, Larynx, and Trachea.—Normal.

Abdomen.

Omentum.—On the ventral surface there were about a dozen pedunculated lenticular tubercles with calcareous centres, the largest about twice the size of a millet seed.

Peritoneum.—Normal.

Spleen.—The spleen, normal in size, showed on section fairly numerous evenly distributed yellow calcareous tubercles with thin fibrous capsules, ranging from 1 to 2 mm. in diameter.

Liver.—Very sparsely scattered throughout the substance of the liver were minute pearly or glassy calcareous tubercles which readily shelled out.

Portal Glands.—The portal glands, not enlarged, contained fairly numerous irregular calcareous tubercles, here and there aggregated together into small groups.

Kidneys.—Normal.

Suprarenal Bodies.—In the cortex of the left there was a grey tubercle, calcareous in the centre, 2 mm. in diameter.

The right was normal.

Alimentary Tract.

Tongue, Pharynx, Tonsils.—Normal.

Intestines.—Several of the Peyer's patches in the small intestine contained soft yellow submucous tubercles slightly gritty from calcification. Large intestine normal.

Mesenteric and Ileo-colic Glands.—These glands were little if at all enlarged, but were rather extensively tuberculous, containing numerous calcareous patches and nodules as well as discrete tubercles ; they were not quite so severely affected as the bronchial and mediastinal glands.

Eyes.—Normal.

Mammary Gland.—Normal.

Various Lymphatic Glands.

The Precrural Glands showed in the cortices scattered yellow calcareous tubercles, irregular in outline, the largest about the size of a millet seed ; they readily shelled out from the gland substance.

The Popliteal, Axillary, Submaxillary, Hyoid, Retropharyngeal, Gluteal, Ischiatic and Pudic, Lumbar and Iliac Glands contained similar tubercles.

The Renal Gland contained similar but rather more numerous tubercles.

Coeliac Glands.—One contained a calcareous patch and a number of discrete calcareous tubercles ; the rest contained discrete calcareous tubercles as in the peripheral lymphatic glands

Microscopical Examination.

Emulsion of Prescapular Gland.—Tubercle bacilli moderately numerous.

Emulsion of Spleen.—Six tubercle bacilli seen.

Animals Inoculated.

One rabbit, No. 1380, was inoculated subcutaneously with an emulsion made from the prescapular gland. (Died 61 days, G.T.)

Two rabbits, Nos. 1381 and 1382, were inoculated subcutaneously with an emulsion made from the spleen. (Died 167 and 110 days, G.T.)

CALF 1237. Virus H 13. "A.D."

Subcutaneous inoculation of emulsion of the left prescapular gland from Calf 1175.

Dose—20·0 cc. of emulsion containing numerous tubercle bacilli.

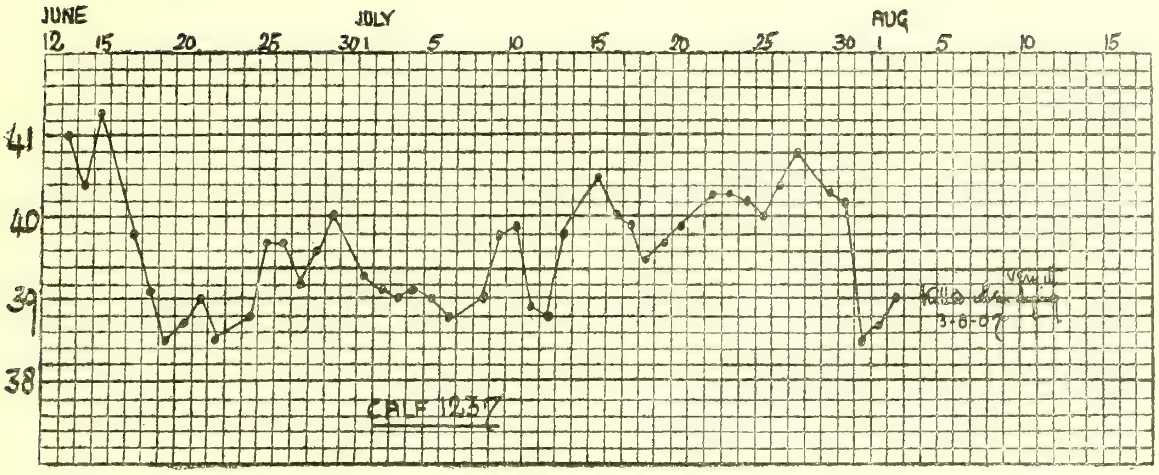
Date of Inoculation—June 12, 1907. [Age about 15 weeks.]

Killed when very ill—August 3, 1907. [52 days after inoculation.]

Clinical Notes.

The course of the disease was similar to that usually seen in calves suffering from acute tuberculosis. On Saturday, August 3, the calf was very ill, emaciated, and breathing rapidly, and appeared likely to die in a day or two. It was therefore killed.

Temperature.



Tuberculin Test.—The calf was not tested subsequent to inoculation.

Weights.

	cwt.	qrs.	lbs.
June 12, 1907	1	0	17
August 3, 1907	1	0	1

Total loss of weight.—16 lbs.

Average rate of loss per week.—2·1 lbs.

POST-MORTEM EXAMINATION.

The carcass was very thin.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a firm elongated tumour measuring 17 by 9·5 cm. by 5 cm. in thickness (the latter measurement including skin and muscle), and weighing 1 lb. 5 ozs.

On section it was composed of three layers, the outer one of skin, 1 cm. in thickness, closely beset with congested caseous tubercles, the inner one of dense pinkish yellow caseo-necrotic substance, the internal one of fibroid muscle tissue closely infiltrated with irregular caseous nodules of various sizes.

Left Prescapular Gland.—The left prescapular gland measured 9 by 5 by 5 cm. and weighed 4 ozs., and was composed practically throughout of dense pinkish yellow caseo-necrotic substance, showing many petechial points of hæmorrhage; the capsule was much thickened.

Right Prescapular Gland.—The right prescapular gland measured 4 by 1·5 by 0·8 cm., and appeared normal on section.

Prepectoral Glands.—On the left side there were four; one rounded and about 1·3 cm. in diameter was caseous throughout, another about the same size was indurated and beset with caseous tubercles, a third was very large, 4 cm. in length, oedematous, and showed scattered whitish foci; the fourth, a very small gland, contained a few early tubercles.

On the right side one was speckled with minute greyish-white foci; another contained three caseous tubercles.

Cervical Glands.—On the left side in the lower part of the neck there was a firm gland 3 cm. in length which was caseous throughout; in the upper part of the neck a gland was caseating throughout, but was not so advanced as that in the lower; a gland near the latter showed numerous caseous tubercles in the cortex; a mid-cervical gland contained one caseous tubercle.

On the right side a lower cervical gland had some caseating patches in the cortex; the rest were normal.

Axillary Glands.—There were three caseous tubercles in the right axillary gland and one in the left.

Thorax.

Pleura.—The lymphatic fringes along the margins of the ribs were here and there very slightly hypertrophied and contained a few miliary tubercles.

On the diaphragmatic pleura there was a cluster of caseating tubercles and a few patches of tuberculous granulations. There were two or three grey millet-seed sized tubercles on the pericardial pleura.

Lungs—The lungs weighed 6 lbs. 10 ozs. The cephalic, the right middle, and the antero-ventral portions of the caudal lobes were extensively hepatized, very little crepitant lung tissue remaining and this chiefly along the dorsal borders, and their surfaces were closely studded with raised grey nodules, the largest about the size of a hemp seed or more; the surfaces of the posterior parts of the caudal lobes were smooth and showed under the pleura numerous nodules, many of which were surrounded by hepatized patches, some occupying the whole of a lobule; on section the parenchyma of the lung was closely beset with grey nodules with yellow caseous centres similar to those seen from the surface; in the caudal lobes several lobules were uniformly dense and caseating.

Thoracic Glands.—The dorsal mediastinal and bronchial glands were enlarged, weighing together 6 ozs.; the long mediastinal gland measured 11 cm. in length. On section, the cortices were composed almost entirely of firm grey translucent tissue mottled with irregular caseous foci and small patches in places forming a network; many of the smaller glands were very oedematous.

Heart.—Around the margin of the left auricle were three grey miliary tubercles. In the wall of the right auricle there was a millet-seed sized caseous tubercle. The heart was otherwise normal.

Larynx and Trachea.—Normal.

Abdomen.

There was no fluid in the peritoneal cavity.

Omentum and Peritoneum.—On the ventral surface of the omentum there were two millet-seed sized grey tubercles. The peritoneum was normal.

Spleen.—The pulp was closely beset with firm caseous nodules with grey margins, varying from 1·5 to 3· mm. in diameter; there were no tubercles on the surface.

Liver.—The liver showed on the surface numerous nodules; some were slightly raised and flattened out up to 3 mm. in diameter, others were situated just beneath the capsule, while others again were dimly seen in the depth; on section the substance was moderately closely beset with tubercles which varied from 1 to 2·5 mm. in diameter; the smaller ones were greyish white, some being distinctly more opaque in the centre than around the margins, the larger ones had yellowish centres.

Portal Glands.—The portal glands were enlarged and closely beset with caseating nodules in places confluent.

Kidneys.—Many of the lobules showed atrophied and fibroid patches in the cortex to which the capsule was adherent; in one of the lobules the greater part of the cortex was replaced by cheesy purulent substances; the cortex of each kidney contained fairly numerous caseating nodules varying from a pin's head to a hemp seed.

Suprarenal Bodies.—These appeared normal.

Coeliac Glands.—Two were slightly enlarged and showed, on section, patches composed of aggregated caseating nodules as well as discrete caseating nodules; another contained one caseating nodule, irregular in outline, the size of a hemp seed.

Renal Gland.—The renal gland was enlarged and closely beset with irregular caseous nodules varying up to 2·5 mm. in diameter.

Lumbar Glands.—The lumbar glands resembled the renal.

Alimentary Tract.

Tongue, Pharynx, Palate, Tonsils.—Normal.

Submaxillary, Retropharyngeal and Parotideal Glands.—Each contained a few miliary caseous tubercles.

Small Intestines.—All the Peyer's patches contained miliary caseous tubercles in small number.

Large Intestine.—Normal.

Mesenteric Glands.—The mesenteric glands, not enlarged, contained scattered discrete caseating nodules, the largest 5 mm. in diameter.

Ileo-colic Glands.—The ileo-colic glands contained numerous small tubercles.

Testes.—Normal.

Eyes.—Normal.

Various Lymphatic Glands.

Precrural Glands.—The right was normal; the left contained three caseous tubercles.

Popliteal, Gluteal and Pudic Glands.—Normal.

Microscopical Examination.

Emulsion of Left Prescapular Gland.—Tubercle bacilli moderately numerous.

Emulsion of Portal Gland.—Tubercle bacilli scanty.

Emulsion of Bronchial Gland. — Tubercle bacilli scanty.

Tubercle from Heart.—Tubercle bacilli, two seen.

Smear from Right Suprarenal.—No tubercle bacilli seen.

Smear from Faeces.—No tubercle bacilli seen.

CALF 1327. Virus H 13. "A.D."

Subcutaneous inoculation of culture derived from the bronchial gland of Calf 1237.

Dose—50·0 milligrammes.

Date of Inoculation—December 30, 1907. [Age about 11 weeks.]

Died—January 26, 1908. [27 days after inoculation.]

Clinical Notes.

The course of the disease was similar to that usually seen in calves suffering from acute tuberculosis.

Temperature.—The temperature rose to 39·6° C. on the third day and reached a maximum of 40·2° C. on the 8th day. It subsequently remained above normal (between 39·0 and 39·9° C.) for 15 days. During the following three days the temperature fell one degree (to 38·0° C.), and on the morning of the next day the animal was found dead.

Weights.

	qrs.	lbs.
December 30, 1907	3	20
January 26, 1908	3	13

Total loss of weight.—7 lbs.

POST-MORTEM EXAMINATION.

The body was thin.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a caseo-necrotic mass, semilunar on longitudinal section, measuring 13 by 9 by 3 cm.; both the skin and the muscles were infiltrated, and the prescapular gland was adherent to it.

Left Prescapular Gland.—The left prescapular gland measured 9 by 4·5 by 4·5 cm., and was composed throughout of dense yellow caseated substance.

Prepectoral Glands.—The prepectoral glands on both sides contained discrete miliary caseous tubercles.

Right Prescapular Gland.—The right prescapular gland measured 5 by 2 by 1 cm., and showed in the cortex numerous discrete miliary caseous tubercles.

Thorax.

Pleura.—The costal and diaphragmatic pleura on the right side was thickly covered with caseous miliary tubercles; there were numerous similar tubercles on the pericardial pleura; on the left parietal pleura miliary tubercles were very sparsely scattered, but in the fringes here and there were groups of grey granules.

Lungs.—The lungs were heavy and weighed 4 lbs. 13 ozs. The anterior and right middle lobes and the greater portions of the posterior lobes were dark red and solid; the rest of the caudal lobes was congested and showed irregular diffuse areas of consolidation; the tissue of the lungs was closely and evenly beset with caseating miliary tubercles.

At the root of the right lung in front of the bronchus there was a collection of thick greenish pus with a fibrous capsule. It was not connected with a bronchus and appeared to be a suppurating gland.

Thoracic Glands.—The bronchial and mediastinal glands were enlarged; their cortices were closely beset with grey caseating tubercles, the majority of which had coalesced forming irregular patches.

Heart. — Muscle and valves normal. There were several clusters of tubercles on the pericardium at the root of the great vessels and a crop of miliary caseous tubercles on the parietal pericardium.

Abdomen.

Omentum and Peritoneum.—The ventral surface of the omentum was rather thickly covered with miliary caseating tubercles.

The parietal peritoneum was normal.

Spleen.—The spleen was much enlarged and weighed 14 ozs.; the pulp was firm and was packed almost as closely as possible with miliary caseating tubercles with reddish margins, with difficulty differentiated from the small amount of red pulp existing between the tubercles; the cut surface had a coarsely granular appearance.

Liver.—The substance of the liver was closely and evenly beset with greyish-white miliary tubercles.

Gall-bladder.—There were a few tubercles in the wall of the gall-bladder.

Portal Glands.—The portal glands were enlarged and showed around the cortices irregular grey patches containing caseous foci and here and there a caseous network.

Kidneys.—Each kidney showed in the cortex fairly numerous grey miliary tubercles with caseous centres.

Suprarenal Bodies.—Each contained about half-a-dozen submiliary greyish-white tubercles.

The Coeliac, Lumbar, and Renal Glands resembled the portal, showing in the cortex aggregations of caseating miliary tubercles.

Testes.—Normal.

Alimentary Tract.

The pharyngeal, laryngeal and tracheal mucous membranes showed numerous miliary tubercles.

There were tubercles under the mucous membrane of the tongue at the base and margins.

Intestines.—There were extremely numerous miliary caseous submucous tubercles throughout the whole length of the small intestine; many of the Peyer's patches were exceptionally closely beset.

The large intestine also showed numerous submucous caseous tubercles.

Various Lymphatic Glands.—All the peripheral lymphatic glands and the mesenteric glands were closely beset with caseous miliary tubercles.

CALF 1207. Virus H 13. "A.D."

Subcutaneous inoculation of culture derived from Calf 301, direct. [The culture had been growing for two generations on glycerin-serum.]

Dose—100·0 milligrammes.

Date of Inoculation—March 26, 1907. [Age 13 weeks.]

Killed when in good health—June 26, 1907. [92 days after inoculation.]

Clinical Notes.

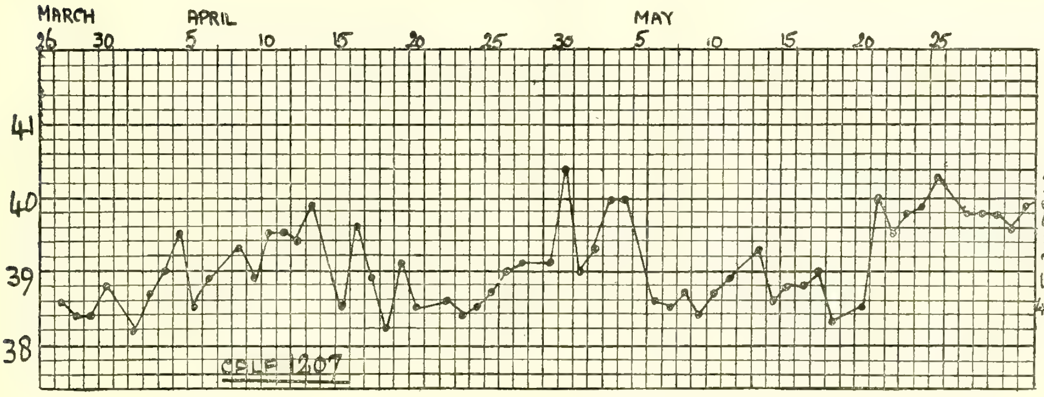
A tumour of moderate size developed at the seat of inoculation on the left side of the neck. On the 24th day it was pear-shaped, measuring 9 by 6 cm.; on the 51st day it measured 11 by 6 cm. and was fluctuating.

The left prescapular gland became moderately enlarged, and on the 51st day measured 9 cm. in length.

No changes of importance took place subsequently in the local conditions.

The calf showed no signs of illness during the experiment.

Temperature.



From June 1 to June 26 the temperature remained high between 39 and 40·0°C

Tuberculin Test.—The calf was not tested subsequent to inoculation.

Weights.

	cwt.	qrs.	lbs.
March 26, 1907	1	0	16
June 26, 1907	1	2	21

Total gain of weight.—2 qrs. 5 lbs.

Average rate of gain per week.—4·7 lbs.

POST-MORTEM EXAMINATION.

The carcass was in fair condition.

Local Lesion.—On the left side of the neck there was a somewhat pear-shaped fluctuating tumour measuring 7 by 5 by 3 cm.; on section it was found to be a cyst, surrounded by a fibrous wall lined with a thin layer of caseous substance rough and shaggy internally, and filled with turbid watery fluid and caseo-necrotic masses and shreds.

Left Prescapular Gland.—The left prescapular gland measured 7·5 by 4·5 by 3 cm., and on section showed about three-quarters of the cortex caseous, parts being homogeneous and of a salmon-pink colour, the rest yellow and highly calcareous ; in the remainder of the gland were discrete calcareous tubercles.

Right Prescapular Gland.—The right prescapular gland measured 3·5 by 1·8 by 1 cm. and contained a few calcareous tubercles.

Prepectoral Glands.—On the left side the rounded gland was slightly enlarged and closely beset with minute calcareous tubercles. Another gland contained one small calcareous tubercle. Those on the right side were normal.

Cervical Glands.—One in the middle of the neck on the left side and two near the articulation of the jaw showed each one or two calcareous tubercles. The rest were normal.

Thorax.

Pleura.—Normal.

Lungs.—The lungs were pinkish in colour and were crepitant throughout with the exception of two or three hepatised lobules in the caudal lobes ; the lung parenchyma contained fairly numerous pale grey tubercles somewhat irregular and occasionally indefinite in outline, varying in size up to 1 mm. ; they were most numerous in the caudal lobes, sparsely scattered in the left cephalic and almost absent in the right cephalic. The larger tubercles all had calcareous centres, but most of the smaller ones were homogeneous throughout.

Thoracic Glands.—The mediastinal and bronchial glands were almost twice the normal in size and were closely beset with calcareous tubercles, in places loosely aggregated together, especially in the larger glands, to form irregular calcareous patches.

Heart.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—The spleen was normal in size and showed attached to the capsule a greyish pink flattened nodule, 1 cm. in diameter, containing calcareous grains in the centre ; on section the pulp contained fairly numerous small calcareous tubercles with grey margins, the largest about 1 mm. in diameter ; 20 were counted in an area 5 cm. square.

Liver.—The liver appeared normal on the surface and on section.

Gall-bladder.—Normal.

Portal Glands.—The portal glands were slightly enlarged, and their cortices were closely beset with irregular yellow calcareous miliary tubercles, forming in places small groups.

Kidneys.—In the cortex of each kidney there were about half-a-dozen translucent grey tubercles slightly opaque in the centre, the largest 1 mm. in diameter ; some were situated just under the capsule while others were found in the depth of the cortex.

Suprarenal Bodies.—In the cortex of the left suprarenal there was a millet seed sized tubercle with a calcareous centre and a fibrous margin. The right was normal.

Coeliac Glands.—The cortex of one was rather closely beset with small irregular calcareous tubercles ; in the others tubercles were more sparsely scattered.

Renal and Lumbar Glands.—These were slightly enlarged, and resembled on section the first coeliac gland.

Iliac Glands.—In the left there were two minute calcareous tubercles. The right contained rather more numerous tubercles, two of which were larger than millet seeds.

Alimentary Tract.

Tongue, Pharynx, Tonsils.—Normal.

Submaxillary and Retro-pharyngeal Glands.—These contained fairly numerous small calcareous tubercles.

Parotideal Glands.—In the parotid glands there were similar but not so numerous tubercles.

Small Intestines.—A Peyer's patch towards the anterior end contained a yellow slightly gritty tubercle the size of a pin's head. In the long terminal patch there were several similar foci and a few small ulcers in the mucous membrane with slightly raised margins but with no caseation in the base.

Large Intestine.—Normal.

Mesenteric Glands. — All showed in the cortex calcareous patches composed of aggregated tubercles, as well as discrete calcareous tubercles.

Ileo-colic Glands. — The ileo-colic glands were closely beset with calcareous tubercles and resembled the mediastinal and portal glands.

Gastric and Colic Glands.—These contained a few discrete calcareous tubercles.

Testicles.—Normal.

Various Lymphatic Glands.

Axillary.—The right contained a pinhead-sized calcareous tubercle. In the left were two calcareous grains.

Popliteal.—The right was normal. The left contained two calcareous foci.

Precrural.—In the cortex of each there were scattered tubercles varying up to 1 mm. in diameter ; a few of the tubercles were caseous and softened, but the majority were quite calcareous.

Pudic.—One contained a millet-seed sized caseous tubercle.

Ischiatic.—Normal.

Gluteal.—In one there was an irregular yellow calcareous tubercle ; the other was normal.

Microscopical Examination.

Emulsion of Prescapular Gland.—Tubercle bacilli numerous.

Emulsion of Mediastinal Gland.—Tubercle bacilli fairly numerous.

Animals Inoculated.

Two rabbits (1354 and 1355) were inoculated subcutaneously with the prescapular gland emulsion, and two (1356 and 1357) with the emulsion made from the mediastinal gland.

1354 and 1357 died of G.T. in 92 and 53 days respectively ; the others died prematurely.

CALF 1301. Virus H 13. "A.D."

Subcutaneous inoculation of culture derived from a large (eugonic) colony [No. 2] on a glycerin-serum plate sown from Guinea-pig 2491. This guinea-pig had been injected with the "Calf 301" strain of culture.

Date of Inoculation—November 12, 1907. [Age about five months.]

Dose—100·0 milligrammes.

Died—January 2, 1908. [51 days after inoculation.]

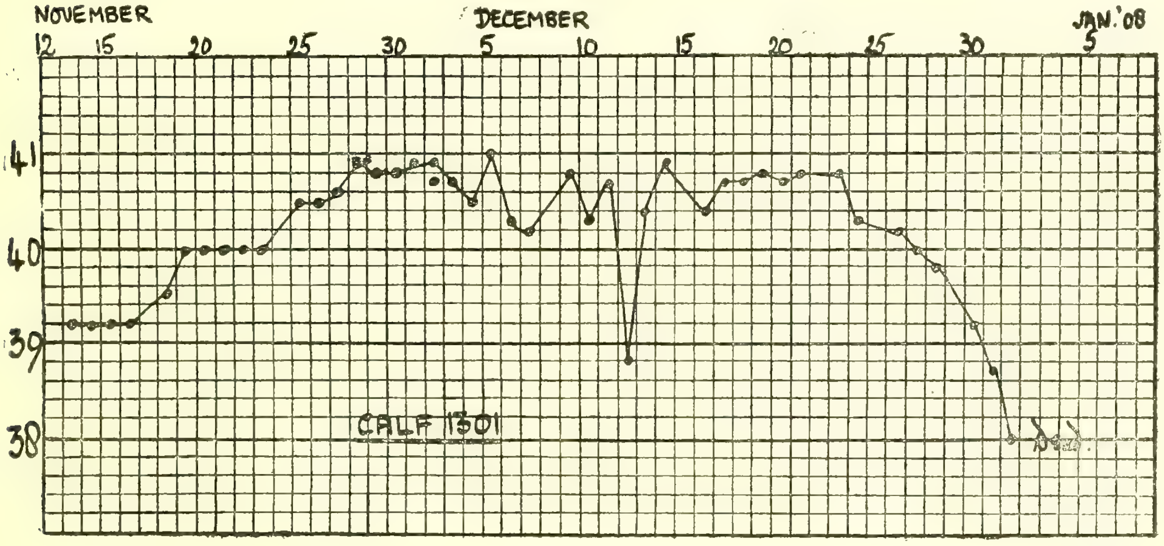
Clinical Notes.

Twenty-three days after inoculation there was a prominent fluctuating pear-shaped tumour measuring 16 by 9 cm. at the seat of inoculation; the adjacent prescapular gland was enlarged and very hard, measuring 11 cm. in length.

The coat was somewhat staring, and the animal appeared to have lost flesh, otherwise the condition was fairly good.

The disease subsequently progressed slowly; the animal gradually became weak and very emaciated, and the respiration laboured, and it died on the 51st day after inoculation.

Temperature.



Tuberculin Test.—The calf was not tested subsequent to inoculation.

Weights.

	cwt.	qrs.	lbs.
November 12, 1907	1	2	18
January 2, 1908...	1	0	22

Total loss of weight.—1 qr. 24 lbs.

Average rate of loss per week.—7 lbs.

POST-MORTEM EXAMINATION.

The carcass was emaciated.

Local Lesion.—The tumour at the seat of inoculation was pear-shaped, prominent, and fluctuating, it weighed 1 lb. 2 ozs. and measured 16 by 9 by 7 cm.

On section a large cavity was seen in the upper part filled with yellow serous fluid containing flakes of caseous material and crossed by fibrous trabeculae. The remainder of the tumour was composed of pinkish-yellow caseo-necrotic substance, breaking down into ragged masses around the cavity, firm elsewhere.

The overlying skin and the subjacent muscles were infiltrated to a slight extent.

Left Prescapular Gland.—The left prescapular gland measured 12·5 by 7 by 4 cm., and was composed throughout of dense pinkish yellow caseated tissue showing no sign of calcification.

Prepectoral Glands.—The rounded gland on the left side measured 1·5 cm. in diameter, and was packed with confluent yellowish-white caseating tubercles.

The kidney-shaped gland was swollen and slightly congested, and showed one small caseating nodule in the cortex.

A third gland on this side was normal.

The prepectoral glands on the right side were normal.

Right Prescapular Gland.—The right prescapular gland measured 5 by 2·4 by 1 cm. It was oedematous and contained a number of irregular caseating tubercles, the largest about 2 mm. in diameter.

Cervical Glands.—A small mid-cervical gland on the left side contained caseating patches; one on the right side showed two caseating tubercles.

The upper cervical glands on the left side were normal; one on the right side contained a caseating tubercle.

Axillary Glands.—The right axillary gland contained a hempseed-sized caseating nodule in the cortex; the left was normal.

Thorax.

Lungs.—The lungs were very heavy, weighing 8 lbs. 14 ozs.; they almost completely filled the chest.

The surface of the whole of the left lung and of the upper lobe of the right was mottled with dark red confluent patches of consolidation; the surface of the remaining lobes of the right lung was almost entirely dark red in colour, small patches and islands of pink tissue alone remaining.

The substance of both lungs under the pleura was thickly and evenly beset with greyish-yellow caseating nodules sometimes confluent, ranging from 1 to 8 mm. in diameter. The upper lobes on both sides were slightly less severely affected than the rest of the lung.

On section of the lung the tubercles appeared even more numerous than they did from the surface, and large caseating patches of various sizes were seen, the largest measuring 1·5 by 0·7 cm.; the condition of the organ on section resembled that on the surface, the right lung being to a large extent dark red and consolidated, the left showing only small patches of consolidation.

Thoracic Glands.—The thoracic glands were very much enlarged and weighed altogether 14 ozs. The long mediastinal gland measured 15 by 6 by 2·7 cm.

On section the cortices were firm and composed of grey translucent fibroid tissue closely beset with yellow caseous areas.

Heart and Pericardium.—Normal.

Larynx and Trachea.—Normal.

Pleura.—There was one loosely attached caseating flattened nodule measuring 8 by 6 mm. on the pleura just behind the second rib on the right side; no tubercles were seen elsewhere on the parietal pleura.

On the pleural surface of the diaphragm there was a group of small loosely attached lenticular tubercles.

There were two caseating nodules situated close together in the wall of the diaphragm, the larger about a hemp seed in size. The peritoneal surface of the diaphragm was normal.

Abdomen.

Omentum and Peritoneum.—On the omentum there was one loosely attached flattened caseating tubercle 0·5 cm. in greatest diameter. The peritoneum was normal.

Spleen.—The spleen was not enlarged, and on section showed scattered yellow caseating tubercles, the largest about 2 mm. in diameter. About sixty were counted in a longitudinal section.

Liver.—The liver was fatty looking and weighed 5 lbs. 6 ozs. The surface was mottled and showed thinly scattered tubercles with yellow centres and translucent margins varying in size from a mere point up to 4 mm. in diameter; one or two of the larger projected on the surface, many were dimly seen through the capsule.

Sparsely scattered tubercles were seen on section.

Portal Glands.—The portal glands were enlarged and oedematous and were packed with coalescing caseating nodules.

Kidneys.—About thirty yellowish-white tubercles were counted on the surface of the left kidney varying from 1 to 4 mm. in diameter. Similar tubercles were sparsely scattered throughout the cortex.

The right kidney was similarly affected.

Suprarenal Bodies.—In the cortex of the left three yellow caseating tubercles were seen, the largest being 3 mm. in diameter. The right was normal.

Coeliac Glands.—One coeliac gland contained several small caseating nodules.

Lumbar and Renal Glands.—These glands were enlarged, oedematous, and similar on section to the portal.

Iliac Glands.—The left was normal, the right contained two small caseating nodules.

Testicles.—Normal.

Alimentary Tract.

Tongue, Pharynx, Tonsils.—Normal.

Retro-pharyngeal Glands.—The left contained a nodule 6 mm. in diameter, the right a single small caseating tubercle.

Parotideal Glands.—Each contained several caseating nodules.

Submaxillary Glands.—Normal.

Intestines.—In one Peyer's patch two millet-seed sized caseous tubercles were seen, in another there was a single tubercle.

Mesenteric Glands.—Nearly all the mesenteric glands contained one or two irregular caseating nodules in the cortex.

Ileo-Colic Glands.—Each contained one or two small caseating patches in the cortex.

Various Lymphatic Glands.

Precrural.—Each contained two caseating nodules, the larger the size of a hemp-seed.

Popliteal.—The left contained two similar nodules, the right was normal.

Pudic, Ischiatic, Gluteal.—Normal.

Microscopical Examination.

Emulsion of Left Prescapular Gland.—Tubercle bacilli numerous.

Emulsion of Portal Gland.—Tubercle bacilli numerous.

Tubercle from a Peyer's Patch.—Tubercle bacilli very numerous.

CALF 1309. Virus H 13. "A.D."

Subcutaneous inoculation of culture derived from a small (dysgonic) colony [No. 5] on a glycerin-serum plate sown from Guinea-pig 2491. This guinea-pig had been injected with the "Calf 301" strain of culture.

Date of Inoculation—November 12, 1907. [Age about five months.]

Dose—44·0 milligrammes.

Died—December 12, 1907. [30 days after inoculation.]

Clinical Notes.

The disease ran a rapid course and was similar to that frequently seen in calves inoculated with 50 mg. of a virulent virus.

On December 5 there was a firm prominent tumour at the seat of inoculation infiltrating the muscles and adherent to the skin and measuring 14 by 9 cm. The adjacent prescapular gland was much enlarged, measuring 11 cm. in length.

The respiration was laboured and much increased in frequency; the animal stood with head stretched out, and coughed frequently. The appetite was poor, but there was no very obvious loss of flesh.

During the following week the animal rapidly grew worse; the respirations became more frequent, the calf lost its appetite and became emaciated. It died on December 12.

Temperature.—On the 7th day the temperature rose to 40·3° C., and remained high [between 39·6° C. and 40·6 C.] until December 10, a period of 22 days. On December 11 the temperature fell 2·0° C. [to 38·4° C.], and the following day the calf was dead.

Tuberculin Test.—The calf was not tested subsequent to inoculation.

Weights.

		cwt.	qrs.	lbs.
November 12, 1907	... ...	1	2	4
December 12, 1907	... ...	1	1	4

Total loss of weight.—1 qr. 0 lbs.

Average rate of loss per week.—6·5 lbs.

POST-MORTEM EXAMINATION.

The carcass was emaciated.

Local Lesion.—In the subcutaneous tissues on the left side of the neck there was a lenticular mass of juicy yellow caseo-necrotic substance measuring 14 by 7 cm., by 2·5 cm. in thickness; the mass was adherent to the skin and muscles, both of which were infiltrated to a slight extent; the muscles were indurated for a depth of about 1 cm. and beset with discrete caseous tubercles.

Left Prescapular Gland.—The left prescapular gland measured 8 by 5·5 by 3 cm., and showed on section about half the cortex dense yellow and caseo-necrotic: the rest of the cortex was indurated, congested, and beset with discrete caseous tubercles.

Right Prescapular Gland.—The right prescapular gland measured 4·6 by 1·5 by 0·8 cm., and showed in the cortex a number of greyish-white miliary tubercles with deeply congested margins.

Prepectoral Glands.—The left prepectoral glands were slightly enlarged, congested, and oedematous, and showed in the cortex scattered greyish-white tubercles up to a millet-seed in size.

The right prepectoral glands contained tubercles similar to those in the right prescapular.

Cervical Glands.—All the cervical glands contained tubercles similar to those in the peripheral lymphatic glands (vide infra).

Thorax.

Pleura.—The fringes along the margins of the ribs were slightly hypertrophied and deeply congested; no tubercles were visible.

Lungs.—The lungs were heavy weighing 7 lbs. 11 ozs.; almost the whole of the parenchyma was dark red firm and quite airless; the only crepitant lung tissue that remained was along the dorsal borders, and this was congested, emphysematous, and showed here and there consolidated lobules.

The tissue of the lungs was closely and evenly beset throughout with miliary grey translucent tubercles.

The condition of the lungs closely resembled that following an intravenous inoculation.

Thoracic Glands.—The dorsal mediastinal and bronchial glands were enlarged and weighed together 8 ozs.; on section the cortices were composed almost throughout of firm greyish tissue containing caseous foci and here and there a caseous network; the medullary portions of the glands were deeply congested.

Heart.—The heart was a little enlarged and flabby, and showed numerous petechial haemorrhages under the pericardium; on the right ventricle a grey miliary tubercle was seen; the endocardium of the right side of the heart showed a number of small greyish-white tubercles; none was seen on the left side.

Larynx and Trachea.—Normal.

Abdomen.

Omentum and Peritoneum.—On the ventral surface of the omentum there was a number of small tubercles, one or two caseating.

The parietal peritoneum was normal.

Spleen.—The spleen was flabby and not enlarged; on section the pulp was soft, and showed on close inspection fairly numerous grey tubercles, the largest the size of a pin's head.

Liver.—The liver had a bright red colour, and was mottled or speckled with yellow foci (parenchymatous degeneration of the lobuli). Under the capsule a few small grey tubercles were seen; similar tubercles were sparsely scattered throughout the substance.

Portal Glands.—The portal glands were enlarged and very oedematous; they showed on section firm greyish patches continuous around the margins of the cortex containing scattered greyish-white foci.

Gall-bladder.—There was one minute tubercle under the mucous membrane of the gall-bladder.

Kidneys.—In the cortex of each kidney, on the surface as well as in the depth, there were scattered greyish-white tubercles, the largest a millimetre in diameter.

Suprarenal Bodies.—In the cortex of each a few minute grey tubercles were seen.

Alimentary Tract.

Pharynx.—In the corrugated membrane of the vault of the pharynx there were two or three small tubercles.

Tongue and Tonsils.—Normal.

Intestines.—The mucous membrane of the small intestine was congested; the Peyer's patches contained scattered soft yellow foci and an occasional grey tubercle.

The mucous membrane of the large intestine was congested; no definite tubercles were seen.

Testicles.—Normal.

Various Lymphatic Glands.

The Peripheral Lymphatic Glands, the Coeliac, Gastric, Mesenteric and Colic Glands, the Lumbar, Iliac, and Renal Glands, and the Retro-pharyngeal, Submaxillary, and Parotideal Glands all contained numerous discrete grey or greyish-white tubercles, which varied in size from a mere point to that of a millet seed; in many of the glands the tubercles were deeply congested around the margins.

The Ischiatic Glands alone were apparently normal.

Microscopical Examination.

Lung (smear from).—Short tubercle bacilli, moderately numerous, in cells.

Suprarenal (tubercle from).—One tubercle bacillus seen.

Spleen (smear from pulp).—One tubercle bacillus seen.

Intestine (tubercle from a Peyer's patch).—Tubercle bacilli numerous.

Intestine (soft focus from a Peyer's patch).—No tubercle bacilli.

CALF 1337. Virus H 13. "A.D."

Subcutaneous inoculation of culture derived from a single colony [No. 7] isolated on a glycerin-serum plate sown from the omentum of Guinea-pig 2605 (from Guinea-pig 2491, "Calf 301" strain).

Dose—59·0 milligrammes.

Date of Inoculation—January 17, 1908. [Age about 14 weeks.]

Killed when in good health—April 2, 1908. [76 days after inoculation.]

Clinical Notes.

The calf remained perfectly well during the experiment.

Temperature.—On the seventh day after inoculation the temperature rose to 40·0° C. and reached a maximum (40·8° C.) on the 11th day; it remained high for ten days; on the 18th day the temperature was again normal, and it remained normal subsequently.

Tuberculin Test.—March 4, 1908. [47 days after inoculation.] Dose, 4·0 cc. of avian tuberculin. No reaction? Rise of temperature, 0·5° C.

Weights.

	cwt.	qrs.	lbs.
January 17, 1908	0	3	3
April 2, 1908	1	1	23

Total gain of weight.—2 qrs. 0 lbs.

Average rate of gain per week.—5 lbs.

POST-MORTEM EXAMINATION.

The carcass was in good condition.

Local Lesion.—At the site of inoculation on the left side of the neck there was a rounded fluctuating swelling measuring 6 by 5 by 3·5 cm.; it was composed of yellow caseo-purulent substance surrounded by a fibrous capsule.

Left Prescapular Gland.—The left prescapular gland measured 5·5 by 2·5 by 1·5 cm.; on section at one extremity there was a group of three dense caseo-calcareous nodules, the largest the size of a pea; at the other there was an irregular caseo-calcareous nodule, 1 cm. in diameter.

Right Prescapular Gland.—The right prescapular gland measured 4·5 by 2 by 1 cm. and was normal on section.

Cervical Glands.—On the left side a gland in the middle of the neck was slightly enlarged and the cortex was beset with yellow caseo-calcareous miliary tubercles, in places confluent. Other cervical glands were normal.

Thorax.

Lungs, Heart.—Normal.

Thoracic Glands.—The left bronchial gland showed one minute greyish-white point. Other thoracic glands were normal.

Pleura and Peritoneum.—On the peritoneum of the floor of the abdomen, and on the surface of the lung, there were several fibrous tags and a few small fibrous nodules.

Abdomen.

Liver, Spleen, Kidneys, Suprarenal Bodies.—Normal.

Portal, Coeliac, Renal, Lumbar, and Iliac Glands.—Normal.

Testicles.—Normal.

Alimentary Tract.

Tongue, Pharynx, Tonsils, Submaxillary and Retropharyngeal Glands.—Normal.

Intestines and Mesenteric Glands.—Normal.

Various Lymphatic Glands.

Precrural, Popliteal, Gluteal, Ischiatic, Axillary, Pudic.—Normal.

Microscopical Examination.

Emulsion of Prescapular Gland.—Tubercle bacilli moderately numerous.

CALF 1343. Virus H 13. "A.D."

Subcutaneous inoculation of culture derived from a single colony [No. 6] isolated on a glycerin-serum plate sown from the omentum of Guinea-pig 2605 (from Guinea-pig 2491, "Calf 301" strain).

Dose—78·0 milligrammes.

Date of Inoculation—January 16, 1908. [Age about 14 weeks.]

Killed when in good health—April 9, 1908. [84 days after inoculation.]

Clinical Notes.

The calf remained well during the experiment.

Temperature.

On the 8th day after inoculation the temperature rose to 40·0° C., and reached 40·3° C. on the 12th day: it then slowly fell, was normal on the 23rd day, and remained normal subsequently.

Tuberculin Test.

March 4, 1908. [48 days after inoculation.]
Dose—8·0 cc. of Leishmann's Tuberculin.
No reaction (?). Rise of temperature=0·6° C.

Weights.

	cwt.	qrs.	lbs.
January 16, 1908	1	0	19
April 9, 1908	1	2	17

Total gain of weight.—1 qr. 26 lbs.

Average rate of gain per week.—4·5 lbs.

POST-MORTEM EXAMINATION.

The carcass was in good condition.

Local Lesion.—At the seat of inoculation there was a prominent circumscribed fluctuating swelling measuring 9 by 7 by 5 cm. On section, it was a cyst containing light brownish turbid fluid and caseo-purulent masses; the wall was of dense white fibrous tissue lined internally with granulation tissue, and the cavity was crossed by stout fibrous trabeculae.

Left Prescapular Gland.—The left prescapular gland measured 5 by 2·5 by 1·7 cm. and showed in the cortex five dense caseo-calcareous masses, the largest 1·5 cm. in greatest diameter.

Right Prescapular Gland.—The right prescapular gland measured 4·2 by 1·8 by 1 cm., and was normal on section.

Prepectoral, Cervical, and Axillary Glands.—Normal.

Thorax.

Pleura, Heart.—Normal.

Lungs.—The lungs were perfectly normal in general appearance. One pinhead-sized reddish-grey tubercle was seen just under the pleura of the right caudal lobe: otherwise the lungs were normal.

Thoracic Glands.—The bronchial and mediastinal glands were normal in size. The left bronchial gland showed on section one greyish-white focus which was not gritty. The other glands were normal.

Abdomen.

Omentum and Peritoneum; Spleen, Liver, Kidneys and Suprarenal bodies.—Normal.

Portal, Coeliac, Renal, Lumbar, and Iliac Glands.—Normal.

Testicles.—Normal.

Alimentary Tract.

Tongue, Pharynx, Palate, Tonsils.—Normal.

Retro-pharyngeal, Submaxillary, and Parotideal Glands.—Normal.

Intestines and Mesenteric Glands.—Normal.

Various Lymphatic Glands.

Precrural, Popliteal, Gluteal, Ischiatic, Pudic.—Normal.

Microscopical Examination.

Emulsion of Left Prescapular Gland.—Tubercle bacilli numerous.

CALF 1191. Virus H 49. "T.C."

Subcutaneous inoculation of culture derived directly from the human mesenteric glands (Blythwood strain).

Dose—50·0 milligrammes.

Date of Inoculation—February 26, 1907. [Age about 4½ months.]

Killed when in good health—May 31, 1907. [94 days after inoculation.]

Clinical Notes.

A fortnight after the inoculation on the left side of the neck there was an elongated firm local swelling, thick above and tapered below, extending into the dewlap and measuring 20 by 8 cm. The left prescapular gland was moderately enlarged, measuring 10 cm. in length.

The tumour and gland afterwards diminished considerably in size. On April 19, 52 days after inoculation, the former measured 14 by 7 cm. and the latter was 7 cm. in length.

The tumour subsequently became soft and fluctuating, and eventually opened and discharged caseopurulent matter.

The general condition and health of the calf remained good during the experiment.

Temperature.—On the 11th day the temperature rose suddenly to 40·7° C. It returned to the normal on the 19th day, and remained normal until the close of the experiment.

Tuberculin Test.—May 9, 1907. [72 days after inoculation.] Reacted. Rise of temperature, 1·8° C.

Weights.

	cwt.	qrs.	lbs.
February 26, 1907	1	3	8
May 31, 1907	2	1	21

Total gain of weight during experiment.—2 qrs. 13 lbs.

Average rate of gain per week.—5·1 lbs.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—In the subcutaneous tissues on the left side of the neck there was an oval tumour measuring 13 by 6·5 by 3 cm.; on section it was found to be composed of cysts or cavities of various sizes filled with creamy caseo-pus and surrounded by dense white fibrous tissue; the cysts were lined internally with granulation tissue in which numerous calcareous grains could be detected. The skin over the tumour was much thickened, measuring 1·5 cm. in greatest thickness.

Left Prescapular Gland.—The left prescapular gland measured 6·5 by 4 by 2 cm. On section it showed five caseo-calcareous nodules varying in diameter from 1 to 2 cm.; some of the nodules were partially softened, others contained small islets of translucent fibroid tissue.

Right Prescapular Gland.—Measured 4·5 by 2·3 by 1 cm. Normal.

Prepectoral and Axillary Glands.—Normal.

Thorax.

Pleura, Lungs, Heart, Thoracic Glands.—Normal.

Abdomen.

Peritoneum, Liver, Spleen, Kidneys, Suprarenals.—Normal.

Portal, Lumbar, Iliac, and Renal Glands.—Normal.

Alimentary Tract.

Tongue, Pharynx, Palate, Tonsils.—Normal.

Submaxillary, Hyoid, Retro-Pharyngeal, and Parotid Glands.—Normal.

Intestines and Mesenteric Glands.—Normal.

Genito-Urinary System.

Testes.—Normal.

Various Lymphatic Glands.

Precrural, Popliteal, Gluteal, Ischiatic, Pudic.—Normal.

Microscopical Examination.

Emulsion of Prescapular Gland.—Tubercle bacilli fairly numerous.

Animal Inoculated.

Rabbit 1318 was inoculated with an emulsion made from the prescapular gland. It showed a local lesion only when killed after 129 days.

CALF 1193. Virus H 49. "T.C."

Subcutaneous inoculation of culture derived directly from the human mesenteric glands (Blythwood strain).

Dose—100·0 milligrammes.

Date of Inoculation—February 26, 1907. [Age about 4½ months.]

Killed when in good health—June 5, 1907. [99 days after inoculation.]

Clinical Notes.

A prominent tumour developed at the seat of inoculation on the left side of the neck. On the 16th day it was firm, and measured 12 by 8 cm. The left prescapular gland was 9 cm. in length. The calf was well.

On the 52nd day the tumour measured 10 by 6 cm. and showed a prominent rounded fluctuating swelling 5 cm. in diameter at the upper part. The prescapular gland was now 7 cm. in length. The calf was in good condition.

Subsequently the tumour opened and discharged, afterwards diminishing greatly in size.

The calf was killed on the 99th day, when quite well.

Temperature.—The temperature rose on the 11th day and reached 39·8° C. on the 13th day, and then quickly fell to normal. Subsequently it was approximately normal, but somewhat irregular, the maximum range of variation during 12 weeks being 1·4° C. (37·9–39·3° C.).

Tuberculin Test.—May 9, 1907. [72 days after inoculation.] Slight reaction. Rise of temperature, 0·8° C.

Weights.

	cwt.	qrs.	lbs.
February 26, 1907	1	3	9
June 5, 1907	2	2	7

Total gain of weight.—2 qrs. 26 lbs.

Average rate of gain per week.—5·8 lbs.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—The lesion at the seat of inoculation on the left side of the neck consisted of thickened skin and a thin patch (in the subcutaneous tissues) of fibrous tissue, about 5 cm. in greatest diameter; the latter was beset with soft caseo-calcareous nodules with translucent fibrous walls, the largest the size of a hemp seed; the thickened skin towards the lower part showed a healed sinus.

Left Prescapular Gland.—The left prescapular gland measured 6 by 3 by 2 cm., and on section showed about two-thirds of its substance replaced by three large nodules with caseo-purulent centres and brownish translucent fibroid margins closely beset with calcareous grains.

Right Prescapular Gland.—The right prescapular gland measured 4 by 2 by 1 cm., and was normal on section.

Prepectoral and Axillary Glands.—Normal.

Thorax.

Pleura, Lungs, Thoracic Glands, Heart.—Normal.

Abdomen.

Omentum and Peritoneum, Liver, Portal Glands, Spleen, Kidneys, Suprarenals; Renal, Lumbar, and Iliac Glands.—Normal.

Alimentary Tract.

Tongue, Pharynx, Tonsils; Glands of the Neck and Throat; Intestines and Mesenteric Glands.—Normal.

Testes.—Normal.

Various Lymphatic Glands.

Precrural and Popliteal, Gluteal and Ischiatic, Pudic.—Normal.

CALF 1213. Virus H 49. "T.C."

Subcutaneous inoculation of culture derived from the human mesenteric glands (Royalcot strain).

Dose—50·0 milligrammes.

Date of Inoculation—April 20, 1907. [Age about 16 weeks.]

Killed when in fair health—July 9, 1907. [80 days after inoculation.]

Clinical Notes.

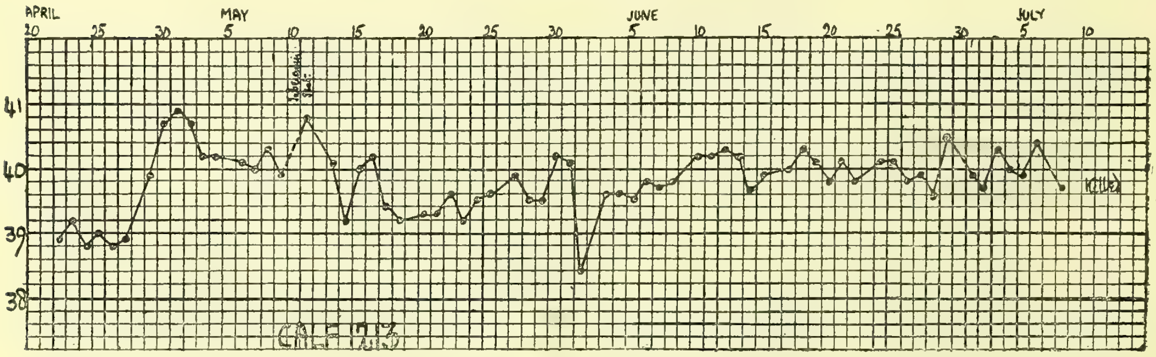
A large tumour developed at the seat of inoculation on the left side of the neck; 24 days after inoculation the tumour measured 17 by 9 cm. It was firm and extended into the dewlap, and the skin over the centre showed a fissure discharging serum. The left prescapular gland was much enlarged, measuring 10 cm. in length.

During the fourth week the calf was off its food, and lay on the ground more frequently than during the earlier part of the experiment. The respiration was not increased, and there was no apparent loss in flesh.

Subsequently the respiration became definitely increased and the calf began to look thin.

Eighty days after inoculation the tumour was soft and fluctuating, partly detached from the muscles, and very pendulous, hanging below the dewlap. The fissure noticed in the overlying skin had closed up. The calf was fairly well but somewhat thin; the respiration was much increased in frequency. On this day it was killed.

Temperature.



Tuberculin Test.—May 9, 1907. [19 days after inoculation.] Reacted. Rise of temperature, 1·2° C.

Weights.

	cwt.	qrs.	lbs.
April 20, 1907	1	1	16
July 9, 1907	1	2	19

Total gain of weight.—1 qr. 3 lbs.

Average rate of gain per week.—2·7 lbs.

POST-MORTEM EXAMINATION.

Carcass in fair condition.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a very large pendulous fluctuating tumour, which measured 22 by 13 by 11 cm. and weighed with attached skin and muscles 1,278 grms.; on section the greater part of the tumour was a cyst filled with thin curdy caseo-pus and irregular caseo-necrotic masses, most of which were attached to the wall of the cavity; the cavity was surrounded by fibrous tissue lined internally with granulation tissue very gritty to the touch; short thick fibrous trabeculae projected into the cavity. The skin was thickened and beset with caseo-calcareous tubercles; the muscles under the cyst were very fibroid and infiltrated with calcareo-caseous tubercles. The lower part of the tumour tapered, and was composed of dense caseous substance surrounded by fibroid tissue infiltrated with calcareo-caseous streaks and foci.

Left Prescapular Gland.—The left prescapular gland weighed 135 grms. and measured 8 by 5·5 by 5 cm.; on section it was composed nearly throughout of dense pinkish-yellow caseous substance gritty only around the peripheral parts; the rest of the gland was beset with calcareo-caseous tubercles.

Right Prescapular Gland.—The right prescapular gland measured 4·5 by 2·2 by 1·2 cm. and showed on section two calcareo-caseous tubercles.

Left Prepectoral Glands.—The rounded gland, 1 cm. in diameter, showed three-quarters of its substance caseo-calcareous and in the rest discrete tubercles.

The kidney-shaped gland contained numerous minute calcareous foci.

Another deeper gland had three or four calcareous miliary tubercles in the cortex.

Right Prepectoral Glands.—Normal.

Cervical Glands.—On the left side one of the lower cervical glands was the size of a thrush's egg, and was dense and caseous throughout and slightly gritty from calcification. Another near it was beset with minute yellow foci; a gland near the articulation of the jaw contained a calcareo-caseous tubercle.

Other cervical glands were normal.

Axillary Glands.—The left axillary gland contained one, the right two, calcareous tubercles.

Thorax.

Pleura.—The lymphatic fringes along the margins of some of the ribs were slightly hypertrophied and contained here and there a small fibrous nodule.

On the diaphragmatic pleura there were some pinkish villous growths around the margins of the tendon, and on the left side an eruption of grey granules; there were also two nodules, one small and loosely pedunculated, the other about 1 cm. in diameter and not pedunculated; both were fibrous and contained calcareous grains.

Lungs.—The lungs were voluminous, emphysematous, and did not collapse on opening the chest; they weighed 4,601 grammes. The surfaces of the small anterior lobes and the ventral surface of each caudal were thickly studded with raised pinkish-grey translucent nodules, varying in shape and size, the largest being about 8 mm. in greatest diameter. They were most numerous on the anterior lobes, particularly where the lobes were in contact, and became gradually less numerous towards the tips of the caudal lobes; on the dorsal surfaces of the caudal lobes there were similar nodules, sparsely scattered.

On section they were found to extend into the lung substance, the pleura passing over them, and to have calcareous centres.

The substance of the lung under the pleura showed numerous irregular greyish-red patches and grey tubercles some calcareous in the centre, and calcareous nodules up to a pea in size irregularly distributed throughout each lobule.

On section of the lung similar appearances were seen; the reddish grey patches occupied the whole or part of a lobule, and in the latter cases were diffuse in outline and were situated chiefly in the centre of the lobule around the bronchus; they contained scattered calcareous tubercles and sometimes a large calcareous nodule.

In the anterior lobes, particularly on the right side, there were larger areas of consolidation than in the caudal lobes.

The fringes around the margins of the lungs were hypertrophied and showed a nodule here and there.

Thoracic Glands.—The thoracic glands weighed 341 grammes, and were much enlarged; they were firm and on section beset with yellow calcareous tubercles which formed in places irregular calcareous patches; the bronchial glands were more severely affected than the mediastinal and in them there was less normal looking gland tissue than in the latter.

The ventral mediastinal glands each contained a caseo-calcareous nodule.

Heart.—Normal.

Abdomen.

There was a slight excess of fluid in the peritoneal cavity.

Omentum.—The lymphatic fringes on the ventral surface were slightly hypertrophied and there were about a dozen loosely pedunculated nodules with calcareous centres and fibrous margins, the largest the size of a barley grain.

Parietal Peritoneum.—There was an eruption of flattened grey nodules, varying in size, on the right side of the diaphragm.

Spleen.—The spleen weighed 284 grammes; it showed on the surface several flattened deep red firm growths containing calcareous foci, and numerous rounded projections caused by nodules in the substance, the capsule over which was deeply congested. On section the pulp contained numerous nodules, varying in diameter up to 5 mm., with grey translucent margins and calcareo-caseous centres.

Liver.—The liver showed on the surface a small number of flat grey growths, loosely attached to the capsule and lying in shallow depressions in the liver substance; the largest measured 1 cm. in diameter and all contained yellow gritty foci; in the substance of the liver under the capsule fairly numerous evenly distributed grey tubercles with calcareous centres, the largest 2 mm. in diameter, were seen; on section similar tubercles were evenly distributed in the depth.

Gall-bladder.—Normal.

Portal Glands.—The portal glands were slightly enlarged and beset with yellow calcareo-caseous tubercles.

Kidneys.—In the cortex of each kidney on the surface as well as on section were fairly numerous nodules varying in size from a pin's head to that of a barley grain; the smaller ones were grey and translucent, the larger ones had yellow calcareous centres; many of the latter projected slightly from the surface and extended in a radial manner deeply into the cortex. There were besides many pale patches on the surface which on section were seen to be the bases of wedge-shaped areas which extended into the cortex.

Suprarenal Bodies.—Each showed in the cortex a hempseed-sized nodule with a grey margin and a calcareo-caseous centre, and several miliary tubercles.

Alimentary Tract.

Tongue, Pharynx, Palate, Tonsils.—Normal.

Intestines, Small.—The mucous membrane of the ileum showed half-a-dozen ulcers with raised congested margins, slightly thickened base and caseous floor.

Intestines, Large.—In the coecum and large intestine there were three or four similar ulcers.

Mesenteric Glands.—The mesenteric glands contained scattered calcareous nodules and tubercles.

Gastric and Colic Glands.—These glands contained discrete calcareous tubercles.

Genito-Urinary Tract.

Testicles.—Normal.

Eyes.—Normal.

Various Lymphatic Glands.

Each Submaxillary, Parotideal, and Retro-pharyngeal Gland contained a few calcareo-caseous tubercles.

Coeliac Glands.—One was slightly enlarged and contained calcareous nodules with translucent fibrous margins confluent in places; others, not enlarged, showed discrete tubercles and nodules.

The Lumbar and Renal Glands were rather closely beset with discrete calcareo-caseous miliary tubercles; there were also a few larger nodules with calcareous centres.

The Precrural, Popliteal, and Iliac Glands contained scattered calcareo-caseous nodules, mostly about 2 mm., but several as much as 3 mm. in diameter.

The Gluteal and Ischiatic Glands were normal.

A Haemo-lymph Gland near a gluteal gland contained a millet-seed sized calcareous tubercle.

Microscopical Examination.

Emulsion of Prescapular Gland.—Tubercle bacilli fairly numerous.

Emulsion of Mediastinal Gland.—Tubercle bacilli scanty.

Animals Inoculated.

Calf 1263 was inoculated subcutaneously with an emulsion made from the left prescapular gland.

Two Rabbits, 1378–1379, were inoculated subcutaneously with the same emulsion. (Died of G.T. in 52 and 78 days.)

Two, Nos. 1376–1377, were inoculated subcutaneously with an emulsion made from the mediastinal gland. (Died of G.T. in 122 and 86 days.)

CALF 1263. Virus H. 49. "T.C."

Subcutaneous inoculation of an emulsion of the left prescapular gland from Calf 1213.

Dose—10·0 cc. of the emulsion, containing fairly numerous tubercle bacilli.

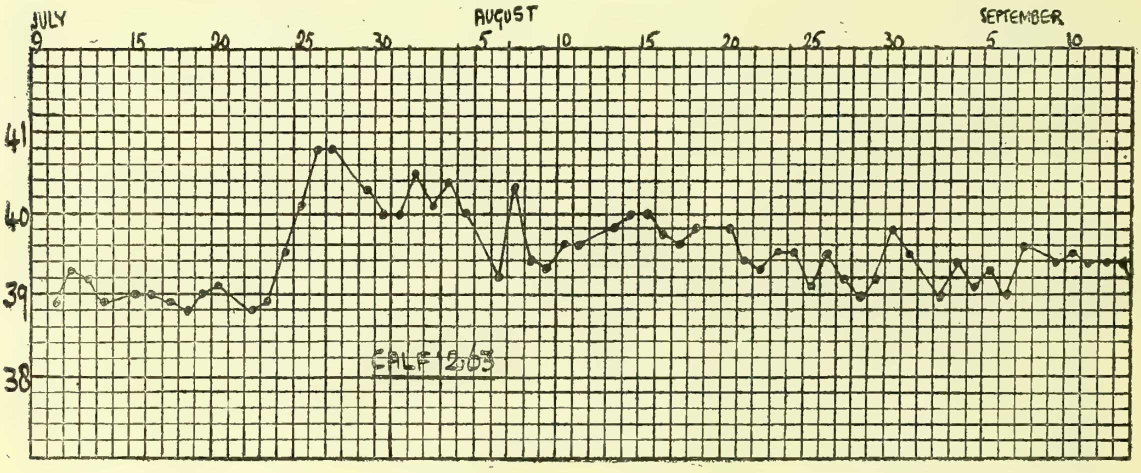
Date of Inoculation—July 9th, 1907. [Age about 17 weeks.]

Killed when in good health—October 8th, 1907. [91 days after inoculation.]

Clinical Notes.

The Calf remained in good health during the whole period of the experiment.

Temperature. (Chart to Sept. 13.)



From Sept. 13 to Oct. 8 the temperature was a little above the normal, and varied only within narrow limits (maximum 39·4° C., minimum 39·0° C.).

Tuberculin Test.—The calf was not tested subsequent to inoculation.

Weights.

	cwt.	qrs.	lbs.
July 9, 1907	1	2	3
October 8, 1907...	2	0	3

Total gain of weight.—2 qrs. 0 lbs.

Average rate of gain per week.—4·3 lbs.

POST-MORTEM EXAMINATION.

The carcass was in good condition.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a firm, prominent, well-defined tumour, which when removed measured 11 by 8 by 5·5 cm., and weighed with skin and attached muscles 14 ozs.

On section it was composed of three layers, a middle one of dense yellow homogeneous caseated tissue 1·5 cm. in greatest thickness, an outer one of greatly thickened skin beset with caseo-calcareous tubercles, and an inner one of fibroid muscular tissue infiltrated with irregular caseo-calcareous nodules and masses.

Left Prescapular Gland.—The left prescapular gland measured 10 by 5 by 4·5 cm., and weighed 6 ozs.; on section it was composed throughout of dense yellow caseous substance slightly gritty from calcification; the capsule was thickened.

Right Prescapular Gland.—The right prescapular gland measured 6 by 2 by 1 cm. and was normal on section.

Prepectoral Glands.—On the left side one round gland measured 1·5 cm. in diameter and contained a caseo-calcareous nodule 8 mm. in greatest diameter; another was normal.

Those on the right side were normal.

Cervical Glands.—One near the angle of the jaw on the left side showed part of the cortex firm and infiltrated with caseo-calcareous points. A small gland in the middle of the neck on the right side contained a small calcareous tubercle.

Other cervical glands were normal.

Thorax.

Pleura.—The fringes along the margins of the ribs were hypertrophied in places; there were no nodules.

On the pleural surface of the diaphragm there was a loosely attached haemorrhagic nodule, the size of a split pea, with a caseo-calcareous centre.

Lungs.—The lungs were crepitant and collapsed normally; they showed on the surface a number of tuberculous growths similar to those on the liver, but containing caseo-calcareous patches, and under the pleura a moderate number of nodules; on section nodules, not in very large numbers, were found evenly distributed throughout the parenchyma; they varied much in size, the largest measuring 1 cm., the smallest about 1 mm. in diameter; the smaller ones were fibrous with calcareous centres, the larger were caseo-calcareous with fibrous margins; there were no patches of consolidation and no adhesions to the chest wall.

Thoracic Glands.—The bronchial and mediastinal glands were enlarged, weighing together 10 ozs.; on section they were dense and calcareo-caseous practically throughout, with the exception of one or two small glands which contained discrete nodules.

Heart and Pericardium.—Normal.

Abdomen.

Omentum and Peritoneum.—On the ventral surface of the omentum there were two small fibrous nodules, one with a calcareous centre.

On the peritoneal surface of the diaphragm there were about a dozen flattened translucent fibroid nodules, some calcareous in the centre.

Spleen.—The spleen was not enlarged and was normal on the surface; on section the pulp contained scattered nodules with yellow calcareous centres and fibrous margins, the largest 4 mm. in diameter. Twenty-seven were counted on one cut surface after longitudinal section.

Liver.—On the surface there were half a dozen slightly raised flattened fibroid growths, the largest 1 cm. in diameter, containing yellow calcareous foci; they were lobular in outline and extended only a short distance into the substance of the liver; under the capsule scattered nodules, some projecting, were seen; on section, nodules similar to those in the spleen were somewhat sparsely scattered throughout the substance.

Portal Glands.—Three were enlarged and closely beset with irregular yellow caseo-calcareous nodules, in places confluent, the largest 5 mm. in diameter; the rest were normal.

Kidneys.—The right kidney showed on the surface five and the left three greyish yellow nodules, the largest 6 mm. in diameter, some of which projected; on section they had grey fibrous margins and calcareo-caseous centres; several were lobular in outline as if composed of a number of smaller nodules, and some were much elongated radially, penetrating in a few cases the whole thickness of the cortex; in the depth of the cortex a few scattered nodules were seen.

Suprarenal Bodies.—Normal.

Lumbar and Coeliac Glands.—Two lumbar glands and one coeliac were enlarged, and on section resembled the portal glands.

Iliac Glands.—Normal.

Testicles.—Normal.

Alimentary Tract.

Tongue, Pharynx, Palate, Tonsils.—Normal.

Retro-pharyngeal, Submaxillary and Hyoid Glands.—Normal.

Parotideal Glands.—In the cortex of the left parotideal gland there was a hempseed sized caseo-calcareous nodule. The right was normal.

Intestines.—Normal.

Mesenteric Glands.—One at the posterior end of the mesentery contained a caseo-calcareous mass 1·7 cm. in greatest diameter; another a little anterior to the latter contained a nodule 5 mm. in diameter.

Ileo-colic Glands.—Normal.

Various Lymphatic Glands.

Precrural, Popliteal, Gluteal, Ischiatic, Pudic.—Normal.

Microscopical Examination.

Emulsion of Prescapular Gland.	A few tubercle bacilli were seen in each, the bacilli were all very short.
Emulsion of Portal Gland	
Emulsion of Thoracic Gland.	

Animals Inoculated.

One rabbit, No. 1536, was inoculated subcutaneously with the emulsion of the left prescapular gland. (Died in 232 days of chronic progressive tuberculosis.)

Another, No. 1537, was inoculated subcutaneously with the emulsion of the portal gland. (Died prematurely.)

CALF 1347. Virus H 49. "T.C."

Subcutaneous inoculation of culture derived from the mediastinal gland of Calf 1263.

Dose—50·0 milligrammes.

Date of Inoculation—December 30, 1907. [Age about 11 weeks.]

Killed when ill—February 20, 1908. [52 days after inoculation.]

Clinical Notes.

A very large tumour developed at the seat of inoculation, which eventually ulcerated.

The calf gradually became ill and thin, and the respiration quickened; weakness and emaciation continued, and when killed on the 52nd day, the animal could not have lived more than a few days longer.

Temperature.—The temperature rose to 40·0° C. three days after inoculation, and reached a maximum (40·5° C.) on the ninth day. Subsequently the temperature was raised and irregular (maximum 40·0° C., minimum 38·2° C.) until the calf was killed.

Tuberculin Test.—The calf was not tested subsequent to inoculation.

Weights.

	qrs.	lbs.
December 30, 1907	3	9
February 20, 1908	3	9

POST-MORTEM EXAMINATION.

The carcass was emaciated.

Local Lesion.—At the seat of inoculation there was a very large firm prominent tumour extending down in front of the shoulder into the dewlap; it measured 15 by 12 by 7 cm. and weighed 2 lbs. 6 ozs.

On section it was composed of an outer layer of pinkish yellow caseo-necrotic substance 2·5 cm. in greatest thickness and an internal layer (3 cm.) of fibroid muscular tissue very closely beset with caseous coalescing nodules. The skin over the greater part of the tumour was necrosed and ulcerating.

Left Prescapular Gland. — The left prescapular gland measured 9 by 5·5 by 5 c.m. and weighed 8 ozs. It was adherent to the local lesion which partly surrounded it. On section, it was dense and caseous throughout.

Right Prescapular Gland.—The right prescapular gland measured 3·5 by 1·8 by 1 cm. and contained several firm caseous nodules.

Prepectoral Glands.—On the left side one was very large, measuring 3·5 cm. in greatest diameter, and showed the major part of the cortex grey and beset with caseous foci; two other small glands showed small caseous tubercles.

Cervical Glands.—All the cervical glands were enlarged; some contained discrete caseous nodules up to 3 mm. in diameter, others showed part of the cortex grey and infiltrated with caseous foci or a caseous network.

Left Axillary Gland.—The left axillary gland was very large and oedematous, and showed numerous minute greyish-white points in the cortex.

Thorax.

Pleura.—On the costal pleura there were several lenticular caseous nodules, varying up to 8 mm.; in several places the lymphatic fringes were hypertrophied and beset with small grey tubercles.

There were similar nodules and tubercles on the pleural surface of the diaphragm.

Lungs.—On the left side there were several recent adhesions to the chest wall, and the lobes on each side showed some slender adhesions to each other; the surfaces of the lungs (except where covered with thick pleura) were studded with raised grey nodules varying in size up to that of a hempseed; there were besides a few flattened caseating nodules similar to those on the parietal pleura; on section the lung was found to be closely beset with nodules similar to those on the surface; they were grey and slightly caseous centrally; many lobules or parts of lobules were solid and caseating, especially in the caudal lobes.

The right anterior lobe was completely hepatised (old), and there were irregular patches in the other small lobes and in the ventral portions of the caudal lobes.

Thoracic Glands. — The dorsal mediastinal and bronchial glands were enlarged, and weighed 7 ozs.; their cortices were composed of translucent grey tissue infiltrated with a yellow caseous network.

Heart.—On the pleural surface of the pericardium there were several lenticular caseating nodules; in the auriculo-ventricular sulcus there was a large caseating nodule.

The endocardium of the right auricle showed a greyish-white miliary tubercle, and under the endocardium of the left ventricle there was a minute grey tubercle.

Trachea.—There was a quantity of mucus and mucopus in the trachea. The tracheal mucous membrane and the larynx were normal.

Abdomen.

Omentum and Peritoneum.—On the ventral surface of the omentum there were about half-a-dozen lenticular caseating nodules, the largest 5 mm. in diameter. The peritoneum was normal.

Spleen.—There were no tubercles on the surface; in the pulp there were fairly numerous completely caseous nodules ranging up to 2·5 mm. in diameter.

Liver.—On the surface there was a moderate number of flattened slightly raised nodules, with yellow caseous centres and grey margins, the largest 5 mm. in diameter; small yellow nodules were seen under the capsule in the substance. On section the substance contained evenly distributed caseous nodules, the largest the size of a hempseed; they were not very numerous, 12 only being counted in an area 5 cm. square.

Portal Glands.—The portal glands were enlarged, and their cortices composed of dense caseating nodular tuberculous masses.

Kidneys.—In the cortex of each kidney there was a moderate number of caseous nodules varying in size from a pin's head to that of a hempseed; the larger ones extended into the cortex in a wedge-shaped manner.

Suprarenal Bodies.—Each showed in the cortex several miliary caseous tubercles.

Lumbar Glands.—The lumbar glands were enlarged and contained more numerous nodules than the peripheral glands (*see* below).

Coeliac Glands.—The coeliac glands were enlarged, their cortices were grey and caseating.

Alimentary Tract.

Tongue, Pharynx, Palate.—Normal.

Tonsils.—One contained a caseous nodule 2 mm. in diameter.

Intestines.—All the Peyer's patches contained one or two yellow caseous nodules up to 2 mm., some ulcerated, and there were a few under the mucous membrane.

There were a few small nodules under the mucous membrane of the large intestine.

Mesenteric Glands.—The mesenteric glands all contained nodules and some grey caseating patches.

Ileo-colic Glands.—The ileo-colic glands showed the cortices extensively replaced by caseating patches.

Gastric and Colic Glands.—These glands contained small caseous tubercles.

Testicles.—Normal.

Peripheral Lymphatic Glands.

All the peripheral lymphatic glands contained moderately numerous yellow caseous nodules, varying in size up to three and sometimes rather more millimetres in diameter.

Eyes.—Normal.

CALF 1387. Virus H 49. "T.C."

Subcutaneous inoculation of culture derived from a single colony (No. 3) isolated from a glycerin-serum plate sown from the sternal gland of Guinea-pig 2918, which received a culture of the original material.

Dose—50·0 milligrammes.

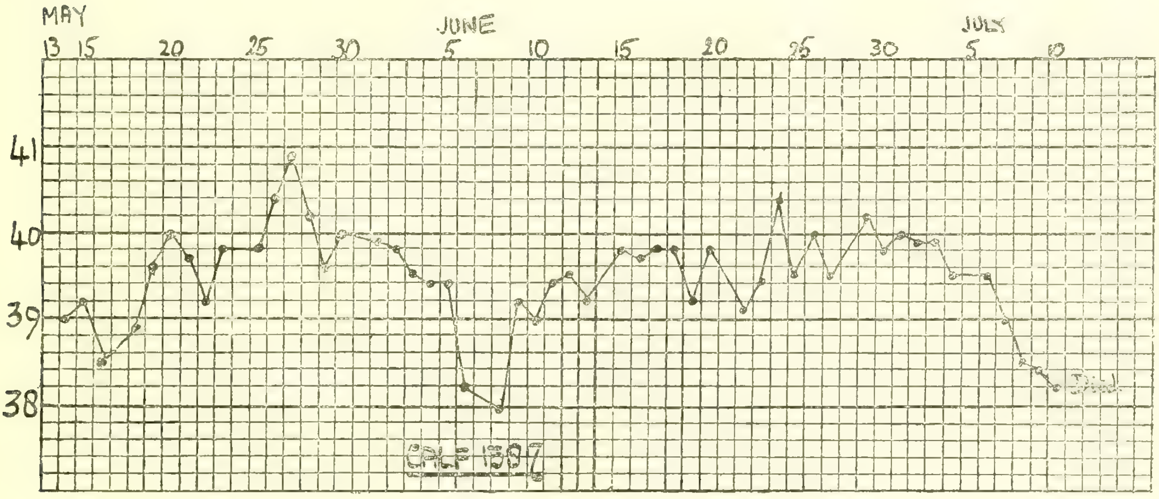
Date of Inoculation—May 13, 1908 [Age about 11 weeks.]

Died—July 10, 1908. [58 days after inoculation.]

Clinical Notes.

A large tumour developed at the seat of inoculation which afterwards ulcerated: the left prescapular gland became greatly enlarged. The calf gradually became ill and thin and the respiration embarrassed; weakness and emaciation followed and the calf died on the 58th day after inoculation.

Temperature.



Weights.

	cwt.	qr.	lbs.
May 13, 1908	1	0	14
July 10, 1908	0	3	12

Total loss of weight.—1 qr. 2 lbs.

Average rate of loss per week.—3·8 lbs.

POST-MORTEM EXAMINATION.

The carcass was emaciated.

Local Lesion.—At the seat of inoculation there was a prominent swelling measuring 16 by 11 by 5 cm., the skin over which was necrosed and represented by a dry dark brown scab; the latter was fissured and partially detached, exposing foul smelling caseo-pus. On section the deeper parts of the tumour were composed of congested fibroid muscular tissue closely beset with caseating nodules and tracts some gritty from calcification.

Left Prescapular Gland.—The left prescapular gland weighed 7 ozs. and measured 10 by 5·5 by 5·4 cm.; on section it was composed practically throughout of dense pinkish-yellow caseous substance slightly gritty from calcification and beginning to break down in places under the capsule.

Right Prescapular Gland.—The right prescapular gland measured 4 by 2 by 0·8 cm. and contained three caseating nodules the largest the size of a hemp seed.

Prepectoral Glands.—Two on the left side showed early caseation of the cortex: two others a caseous tubercle or two.

Those on the right side each contained a few caseating nodules.

Cervical Glands.—One on the left side near the first rib was enlarged, the cortex was grey and showed discrete caseous tubercles; most of the other cervical glands contained one or two discrete caseous nodules.

Axillary Glands.—The cortex of the left axillary gland was firm and showed minute caseous foci.

The right axillary gland contained one caseous nodule.

Thorax.

There was a slight excess of fluid in the pleural cavities.

Pleura.—The costal and diaphragmatic pleurae showed a few congested flattened nodules and patches of congested vegetations.

Lungs.—The lungs filled the chest and weighed

5 lbs. 2 ozs. On the surface there were scattered congested caseating nodules up to 5 mm. in diameter; the anterior lobes, a small portion at the antero-ventral end of the left caudal lobe and almost the whole of the right caudal lobe were red and consolidated; both caudal lobes on section showed moderately numerous caseating nodules varying in size up to about 3 mm. congested around the margins and in places confluent; there were similar nodules in the anterior lobes but much less numerous; the consolidated tissue on section showed a greyish mottling (? early tuberculous infiltration); the trachea and many of the bronchi contained muco-pus.

The mucous membrane of the trachea and larynx was normal.

Thoracic Glands.—The bronchial and mediastinal glands were much enlarged, especially the long mediastinal gland, which measured 15 cm. in length; on section the cortices were composed of greyish fibroid tissue containing gritty caseous tubercles and irregular caseous patches.

Heart.—Normal.

Abdomen.

Omentum and Peritoneum.—On the ventral surface of the omentum there were sparsely scattered flattened congested nodules.

The parietal peritoneum was normal.

Liver.—The liver showed on the surface scattered flattened caseating growths, some loosely attached, others attached by a broad base, the largest about 1 cm. in diameter. On section the substance contained sparsely scattered grey tubercles with caseous centres the largest the size of a millet seed.

Portal Glands.—The portal glands were enlarged and the cortices filled with nodular caseating masses.

Spleen.—The spleen was not enlarged and contained moderately numerous grey nodules with caseous centres varying up to 3 mm. in diameter.

Kidneys.—On the surface of the left kidney there were twenty-eight caseous nodules varying in size up to that of a hemp-seed; some projected from the surface, a few were elongated in a radial direction; a few caseous nodules were seen on section.

On the surface of the right kidney there were twenty-two caseous nodules and several were seen in the depth of the cortex.

Suprarenal Bodies.—Normal.

Coeliac Glands.—The coeliac glands were enlarged and composed practically throughout of greyish tissue surrounding yellow caseous nodules.

Lumbar and Renal Glands.—The lumbar and renal glands were beset with caseating nodules.

Alimentary Tract.

Tongue, Tonsils, and Pharynx.—Normal.

Small Intestines.—On the mucous surface three small ulcerated caseous nodules were seen.

Large Intestine.—Normal.

Mesenteric Glands.—All the mesenteric glands were affected, containing caseating nodules, the largest 1·5 cm. in diameter.

Ileo-colic and Colic Glands.—The ileo-colic and several of the colic glands contained similar nodules.

Testicles.—Normal.

Various Lymphatic Glands.

The peripheral lymphatic glands contained a varying number of caseating nodules (up to 3 mm. in diameter), most numerous in the retro-pharyngeal and precrural glands.

Microscopical Examination.

Emulsion of Prescapular Gland.—A few tubercle bacilli seen.

Emulsion of Mediastinal Gland.—A few tubercle bacilli seen.

Emulsion of Popliteal Gland.—A few tubercle bacilli seen.

CALF 1415. Virus H 49. "T.C."

Subcutaneous inoculation of culture derived from a single colony (No. 7) isolated from a glycerin-serum plate sown from Guinea-pig 2918. This guinea-pig was inoculated with the original strain of culture.

Dose—50·0 milligrammes.

Date of Inoculation—May 18, 1908. [Age about 13 weeks.]

Killed when in good health—August 28, 1908. [102 days after inoculation.]

Clinical Notes.

The calf remained in good health during the experiment.

Temperature.

There was a slight rise of temperature commencing on the tenth day and lasting ten days (maximum 40·2° C.). With this exception the temperature was perfectly normal during the experiment.

Tuberculin Test.

August 18, 1908. [92 days after inoculation.] Dose, 2·0 cc. Reacted. Rise of temperature, 1·5° C.

Weights.

	cwt.	qr.	lbs.
May 18, 1908	1	0	18
August 28, 1908	1	1	25

Total gain of weight.—1 qr. 7 lbs.

Average rate of gain per week.—2·4 lbs.

POST-MORTEM EXAMINATION.

The carcass was in good condition.

Local Lesion.—On the left side of the neck there was a prominent circumscribed fluctuating tumour measuring 9 by 5·5 by 4 cm.; on section it contained a loose dense caseous sequestrum separated from a thick fibrous capsule by yellow pus.

Left Prescapular Gland.—The left prescapular gland measured 6 by 3 by 2·5 cm. and showed more than three quarters of its substance composed of dense caseous material slightly gritty from calcification.

Prepectoral Glands.—On the left side one contained a fibro-calcareous nodule 5 mm. in diameter. The rest were normal.

Right Prescapular Gland.—The right prescapular gland measured 5 by 2·2 by 1 cm. and was normal on section.

Other glands and all the organs were examined and found normal.

Microscopical Examination.

Emulsion of Prescapular Gland.—A few beaded tubercle bacilli seen.

CALF 1413. Virus H 49. "T.C."

Subcutaneous inoculation of culture derived from a single colony (No. 17) isolated from a glycerin-serum plate sown from Guinea-pig 2918. This guinea-pig was inoculated with the original strain of culture.

Dose—50·0 milligrammes.

Date of Inoculation—May 18, 1908. [Age about 11 weeks.]

Killed when in good health—September 2, 1908. [107 days after inoculation.]

Clinical Notes.

The calf remained well during the experiment.

Temperature.

On the 10th day after inoculation the temperature rose from the normal sharply to 40·3° C. and then slowly fell; on the 17th day it was again normal (38·9° C.), and remained normal until the animal was killed.

Tuberculin Test.

August 18, 1908. [92 days after inoculation.] Dose, 2·0 cc. Reacted. Rise of temperature, 2·1° C.

Weights.

	cwt.	qr.	lbs.
May 18, 1908	1	0	5
September 2, 1908	1	1	18

Total gain of weight.—1 qr. 13 lbs.

Average rate of gain per week.—2·7 lbs.

POST-MORTEM EXAMINATION.

The carcass was in good condition.

Local Lesion.—The lesion at the seat of inoculation on the left side of the neck consisted of a small subcutaneous mass of fibrous tissue containing scattered calcareous nodules, and a cyst 1 cm. in diameter filled with caseo-pus; the skin showed a funnel-shaped depression, the apical part of which was formed by scar tissue.

Left Prescapular Gland.—The left prescapular gland measured 7 by 4 by 3·5 cm. and was composed throughout of very dense pinkish yellow caseous substance, gritty from calcification; the capsule was much thickened, and was in places separated from the dense caseous substance by caseo-pus.

Right Prescapular Gland.—The right prescapular gland measured 4·8 by 1·5 by 0·8 cm. and was normal on section.

Prepectoral Glands.—One prepectoral gland on the left side contained a hempseed-sized caseo-calcareous nodule. Other prepectoral glands were normal.

Cervical Glands.—On the left side two contained each one caseous miliary tubercle; in another there were two pinhead-sized caseous tubercles, one gritty.

Thorax.

Pleura and Heart.—Normal.

Lungs.—The lungs were crepitant throughout; they showed under the pleura evenly distributed not very numerous nodules varying in size from a pin's head up to a little larger than that of a hemp seed; 78 were counted on the surface of the left lung. They were calcareous and had grey fibrous margins. Similar nodules were sparsely scattered throughout the substance of the lung.

Thoracic Glands.—The bronchial and mediastinal glands were a little enlarged; their cortices were closely beset with highly calcareous tubercles mainly discrete, but here and there aggregated together.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—The spleen was normal in size; the pulp contained scattered yellow calcareous tubercles ranging from 1·5 to 2·5 mm. in diameter; each had a grey fibrous capsule from which the calcareous centre easily shelled; three dozen were counted on the two cut surfaces after longitudinal section.

Liver.—In the substance of the liver under the capsule there were eight grey tubercles up to a millimetre in diameter all with calcareous centres; two similar tubercles were seen in the depth.

Portal Glands.—The portal glands were not enlarged. Each contained a few calcareous tubercles up to a millet seed in size.

Kidneys and Suprarenal Bodies.—Normal.

Renal Glands.—Between the kidneys there were four pigmented glands, each of which contained a few yellow calcareous foci.

Coeliac Glands.—One coeliac gland—not enlarged—contained discrete yellow calcareous miliary tubercles.

Lumbar and Iliac Glands.—Normal.

Alimentary Tract.

Tongue, Pharynx, Tonsils.—Normal.

Retro-pharyngeal Glands.—The right contained two nodules each 2 mm. in diameter, one caseous the other calcareous.

Submaxillary Glands.—Normal.

Parotideal Glands.—The left showed a cavity rather more than 1 cm. in diameter filled with tenacious yellow pus.

Intestines.—Normal.

Mesenteric Glands.—The mesenteric glands contained two calcareous tubercles.

Ileo-colic Glands.—Two ileo-colic glands showed scattered calcareous tubercles.

Mammary Gland.—Normal.

Various Lymphatic Glands.

Precrural, Popliteal, Gluteal, Ischiatic, Pudic.—Normal.

Microscopical Examination.

Emulsion of Lung Tubercle.—Few tubercle bacilli.

Emulsion of Bronchial Gland.—Few tubercle bacilli.

Pus from Left Parotideal Gland.—No tubercle bacilli.

CALF 1501. Virus H 49. "T.C."

Subcutaneous inoculation of culture derived from Colony No. 17 isolated from a glycerin-serum plate sown from the sternal gland of Guinea-pig 2918.

Dose—48·0 milligrammes.

Date of Inoculation—November 12, 1908. [Age 7 weeks.]

Died—December 27, 1908. [45 days after inoculation.]

Clinical Notes.

The course of the disease was similar to that usually seen after the inoculation of 50·0 mg. of a virulent virus.

Temperature.

On the day following the inoculation the temperature was 39·5° C.; it rose slowly and reached 41·0° C. on the 9th day. The temperature was raised during the remaining period of the experiment, averaging about 40·1° C.; on the day of death it dropped sharply from 39·8° C. to 38·1 C.

Weights.

		qrs.	lbs.
November 12, 1908	... ...	3	22
December 27, 1908	... ...	3	5

Total loss of weight.—17 lbs.

Average rate of loss per week.—2·6 lbs.

POST-MORTEM EXAMINATION.

The carcass was thin.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a prominent firm tumour measuring 11·5 by 8 by 4 cm. composed of pinkish caseo-necrotic substance infiltrating both the skin and the muscles.

Left Prescapular Gland.—The left prescapular gland measured 7·5 by 4·5 by 3·5 cm.; the cortex was composed of dense pinkish-yellow caseo-necrotic substance, in which opaque yellow calcareous foci and fine streaks were seen; a small portion of the medulla was composed of yellowish-white confluent caseous tubercles.

Right Prescapular Gland.—The right prescapular gland measured 4·5 by 2 by 0·6 cm. and contained in the cortex a moderate number of caseous tubercles varying from 1 to 2 mm. in diameter.

Left Prepectoral Glands.—The round gland measured 1·9 cm. in diameter and was composed throughout of firm greyish-red tissue beset with caseous foci; a second prepectoral gland showed confluent tubercles in its cortex and a few small discrete tubercles in the reddish medulla. A third showed in the cortex small patches of caseous tubercles and a few small yellowish-white discrete tubercles in the medulla.

Right Prepectoral Glands.—The right prepectoral glands contained a few small yellowish caseous tubercles and larger caseating nodules.

Left Cervical Glands.—The lower cervical gland on the left side contained numerous small discrete caseous tubercles some of which were becoming confluent. A mid-cervical gland was entirely composed of greyish-yellow necrotic substance. The left upper cervical gland showed in its cortex a moderate number of yellowish-white caseous tubercles varying from 1 to 3 mm. in diameter; each of the other cervical glands contained a few caseous tubercles.

Right Cervical Glands—In each of the cervical glands on the right side there were a few tubercles the majority of which were a little more than 2 mm. in diameter.

Axillary Glands.—In the left axillary gland there were three yellowish nodules measuring rather more than 2 mm. in diameter and a moderate number of small discrete yellowish-white caseous tubercles in the cortex. The right contained four similar nodules.

Thorax.

Lungs.—The lungs were heavy weighing 4 lbs. 12 ozs.; the cephalic, right middle, and antero-ventral portions of the caudal lobes were dark-red firm and almost completely airless; the rest of the caudal lobes was congested and mottled with irregular patches of red hepatization; the lung parenchyma was closely and evenly beset with firm caseous nodules varying up to about 2·5 mm. in diameter; here and there throughout the lung they were aggregated together into groups in places forming irregular nodules.

Thoracic Glands.—The bronchial and dorsal mediastinal glands were enlarged, the long mediastinal measuring 13·5 by 3·5 by 2·5 cm.; they were firm and composed practically throughout of dense congested greyish-yellow caseating tissue showing here and there opaque yellow points probably of beginning calcification; in the medulla of some of the glands there were discrete caseous tubercles.

A ventral mediastinal gland on the left side measured 3 by 2·5 by 1 cm. and was composed practically throughout of firm reddish tissue infiltrated with a caseous network.

Heart.—Under the endocardium of the right auricle four small greyish-white tubercles were seen: the heart was otherwise normal.

Pleura.—The villous fringes on the pleural surface of the diaphragm were hypertrophied; there was one lenticular growth measuring 4 mm. in diameter, yellowish-white and caseous in the centre.

The fringes along the intercostal spaces were hypertrophied but no tubercles were seen.

Larynx.—The mucous membrane of the larynx showed four caseous tubercles with congested margins and ulcerated surface.

Trachea.—There were a few congested spots with caseous centres in the mucous membrane of the trachea.

Abdomen.

Omentum and Peritoneum.—On the surface of the omentum there were counted seventeen loosely attached flattened caseating growths, the largest measuring a little more than 6 mm. in diameter.

The peritoneum was normal.

Spleen.—The spleen was moderately closely beset with firm greyish-yellow nodules varying from 2 to nearly 3 mm. in diameter.

Liver.—The liver showed on the surface just beneath the capsule numerous evenly distributed yellowish tubercles varying from 1 to 2 mm. in diameter. On section similar tubercles were seen evenly distributed throughout its substance; besides the caseous tubercles there were many minute grey tubercles.

Portal Glands.—The portal glands were enlarged and slightly oedematous; their cortices were moderately closely beset with coalescing caseous tubercles, and there were a few discrete caseous tubercles in the medulla.

Coeliac Glands.—The coeliac glands were enlarged, their cortices contained caseous tubercles becoming confluent, and the medullae a few discrete tubercles measuring 1 mm. in diameter.

Kidneys.—On the surface of the right kidney twenty-one yellowish tubercles varying from 1 to 2 mm. in diameter were counted. Some of the tubercles had grey margins. Two caseous tubercles with grey margins were seen in the cortex on section.

On the surface of the left kidney nine tubercles similar to those in the right were counted and four were seen in the cortex on section.

Suprarenal Bodies.—Each suprarenal contained in the cortex one yellowish-white caseous tubercle measuring a little more than 1 mm. in diameter.

Renal Glands.—The right was moderately closely beset with yellowish-white coalescing caseous tubercles, the left showed caseous tubercles becoming confluent.

Lumbar Glands.—All the lumbar glands showed discrete whitish caseous nodules, in places aggregated together, measuring from 2 to 3 mm. in diameter.

Iliac Glands.—Each iliac gland contained about ten caseous nodules.

Alimentary Tract.

Tongue.—Under the mucous membrane at the base of the tongue there were a few small tubercles.

Pharynx.—In the mucous membrane at the vault of the pharynx there were a few caseous tubercles.

Tonsils.—The left tonsil contained four, the right five firm caseous nodules, the largest almost the size of a hemp-seed.

Parotideal Glands.—Each parotideal gland contained about twenty yellowish caseous nodules varying in size from 1 to 3 mm. in diameter.

The Submaxillary and Retro-pharyngeal Glands contained similar tubercles.

Intestines.—The walls of the small intestine were thin; every Peyer's patch contained soft yellowish-white tubercles varying from 1 to 2 mm. in diameter; they were moderately numerous in the long Peyer's patch in the ileum, and varied in number from two to eight or nine in the smaller patches. A few similar tubercles were seen scattered about in the submucosa of the duodenum and the jejunum.

The lymphoid follicles in the large intestine were enlarged, and each showed a central depression but no sign of caseation.

Gastric Glands.—All the gastric glands were enlarged and contained confluent caseous tubercles.

Mesenteric Glands.—Some of the mesenteric glands were slightly enlarged; each showed in the cortex discrete caseous tubercles or caseating patches up to 5 mm. in diameter.

Ileo-colic Glands.—The ileo-colic glands were enlarged and showed in the cortex moderately numerous yellowish white tubercles becoming confluent.

Various Lymphatic Glands.

Precrural Glands.—Both contained a moderate number of yellow caseous nodules, the majority measuring 3 mm. in diameter and in places becoming confluent.

Popliteal Glands.—The popliteal glands were similar to the precrural.

The Supramammary Gland contained three caseous nodules 3 mm. in diameter.

Gluteal Glands.—In the left there were five yellowish-white tubercles measuring rather more than 1 mm. in diameter; the right contained nine similar tubercles.

Ischiatic Glands.—The left contained one similar tubercle; the right was normal.

Brain.—Normal.

Microscopical Examination

Smear from a Tubercle in the Small Intestine.—Tubercle bacilli numerous.

CALF 1203. Virus H 60. "W.B."

Subcutaneous Inoculation of culture derived from the human bronchial gland, through G.P. 1825 (The strain had been nearly a year in artificial cultivation and was tested after growth on glycerin-media).

Dose—48·0 milligrammes

Date of Inoculation—March 26, 1907. [Age 13 weeks.]

Killed when in good health—July 1, 1907. [97 days after inoculation.]

Clinical Notes.

A large tumour developed at the seat of inoculation on the left side of the neck; three weeks after inoculation it was firm and prominent, measuring 15 by 8 cm., and between 3 and 4 cm. thick. The left prescapular gland was 10 cm. in length; the left prepectoral gland was the size of a small walnut. The calf was in good condition.

The tumour subsequently became pendulous and cystic, and eventually (on June 30th) opened and discharged thick caseo-pus.

The calf remained in good health during the whole period of the experiment.

Temperature.

During the first three weeks after the inoculation the temperature was a little raised (maximum 39·8° C.). Subsequently it was approximately normal.

Tuberculin Test.

The Calf was not tested subsequent to inoculation.

Weights.

	cwt.	qrs.	lbs.
March 26, 1907	1	0	26
July 1, 1907	2	0	15

Total gain of weight.—3 qrs. 17 lbs.

Average rate of gain per week.—7·2 lbs.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a baggy partially collapsed oval cystic swelling, measuring 12 by 8 cm. in superficial area; on section the cyst was partially filled with thick tenacious caseo-pus, and was surrounded by a thick wall of fibrous tissue lined internally with granulation tissue beset with caseo-calcareous tubercles; the skin was adherent to the anterior wall of the cyst and was greatly thickened; it was pierced towards the upper extremity by a sinus the diameter of a crowquill, which communicated with the interior of the cavity and through which caseo-pus could be expressed.

Left Prescapular Gland.—The left prescapular gland measured 8 by 4·5 by 3 cm., and showed on section two dense irregular caseous masses calcareous around the margins occupying rather more than half of the gland substance.

Right Prescapular Gland.—(4·3 by 2·2 by 1 cm.). Normal.

Left Prepectoral Glands.—The rounded gland was about the size of a thrush's egg and had about a third of its substance replaced by dense caseo-calcareous substance. The reniform gland was much enlarged and showed on section scattered calcareous foci.

Right Prepectoral Glands.—Normal.

Cervical Glands.—A lower cervical gland on the left side of the neck contained two or three calcareous tubercles. Other cervical glands were normal.

Thorax.

Pleura.—The parietal pleura was normal; on the diaphragmatic pleura there was one pin-head sized fibrous tubercle.

Lungs.—The lungs were perfectly normal in general appearance; on close inspection sparsely scattered grey tubercles, ranging up to 1 mm. in diameter, were seen under the pleura; twenty-four were counted on the surface of the left and there was about the same number on that of the right; similar tubercles were sparsely scattered throughout the substance of the lung; the larger tubercles had calcareous centres, the smaller ones were quite grey and translucent.

Larynx and Trachea.—Normal.

Thoracic Glands.—The bronchial and dorsal mediastinal glands were not enlarged; on section they were beset, though not very closely, with discrete calcareous tubercles which could be readily shelled out from normal-looking gland substance. The ventral mediastinal glands were normal.

Heart and Pericardium.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—The spleen, normal on the surface, showed on section altogether about fifty grey nodules with calcareous centres, ranging in size from a millet to a hemp seed.

Liver.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Portal Glands.—The portal glands, not enlarged, contained discrete calcareous tubercles similar to those in the thoracic glands, but not so numerous.

Coeliac Glands.—The coeliac glands were not enlarged; one showed a small group of calcareous tubercles; another contained one calcareous tubercle.

Renal, Lumbar, and Iliac Glands.—One lumbar gland contained two minute calcareous tubercles. The renal and iliac glands were normal.

Ilio-sacral Glands.—Normal.

Alimentary Tract.

Tongue, Pharynx, Tonsils.—Normal.

Intestines.—Normal.

Mesenteric Glands.—In the cortex of one there was a minute calcareous tubercle.

Gastric, Ileo-colic and Colic Glands.—Normal.

Testicles.—Normal.

Various Lymphatic Glands.

Retro-pharyngeal Glands.—One contained a small group of calcareous grains; in the other there was a small calcareous tubercle.

Submaxillary, Parotideal, Mastoid, Axillary, Precrural, Popliteal, and Pudic Glands.—Normal.

Microscopical Examination.

Emulsion of Prescapular Gland.—Tubercle bacilli fairly numerous.

Emulsion of Bronchial Gland.—One tubercle bacillus seen.

Animals Inoculated.

One rabbit was inoculated with the bronchial gland emulsion, No. 1363, subcutaneously (died 111 days, G.T.).

Two rabbits were inoculated with the prescapular gland emulsion, Nos. 1364, 1365, both subcutaneously (the former died prematurely, the latter died of chronic G.T. in 138 days).

CALF 1481. Virus H 60. "W.B."

Subcutaneous inoculation of culture derived from a single colony (No. 1) isolated from a glycerin-serum plate sown from Guinea-pig 2489.

Dose—50·0 milligrammes.

Date of Inoculation—July 30, 1908. [Age about 18 weeks.]

Killed when in good health—November 3, 1908. [96 days after inoculation.]

Clinical Notes.

The calf remained well during the experiment.

Temperature.

On the 9th day after inoculation the temperature rose to 40·3° C. and continued high (about 40·0° C.) for 17 days. It then fell to the normal and remained normal subsequently.

Weights.

	cwt.	qrs.	lbs.
July 30, 1908	1	2	1
November 3, 1908	1	3	21

Total gain of weight.—1 qr. 20 lbs.

Average rate of gain per week.—3·4 lbs.

POST MORTEM EXAMINATION.

The carcass was in good condition.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a tumour measuring 9 by 6 by 5 cm. which on section was composed of fibrous tissue with a cavity in the centre filled with caseo-pus.

Left Prescapular Gland.—The left prescapular gland measured 6 by 3 by 2·5 cm. and contained one large fibro-caseo-calcareous mass and several smaller ones; they replaced about two-thirds of the gland tissue.

Right Prescapular Gland.—The right prescapular gland measured 5 by 2 by 1 cm. and was normal on section.

Prepectoral, Axillary, and Cervical Glands.—Normal.

Thorax.

Lungs.—Under the pleura seven submiliary grey tubercles with minute calcareous centres were seen. A few tubercles were seen on section.

Thoracic Glands, Pleura, Heart.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Liver.—Under the capsule there were two grey tubercles each with a minute yellow centre; no tubercles were seen on section.

Spleen, Kidneys, and Suprarenal Bodies; Renal, Lumbar, Iliac, and Portal Glands.—Normal.

Alimentary Tract.

Tongue, Pharynx, Palate, Tonsils; Submaxillary, Retro-pharyngeal, and Parotideal Glands; Intestines and Mesenteric Glands.—Normal.

Ileo-colic Glands.—One ileo-colic gland contained two or three calcareous grains.

Mammary Gland.—Normal.

Various Lymphatic Glands.

Precrural, Popliteal, Gluteal, Ischiatic, and Pudic.—Normal.

Microscopical Examination.

Focus from Liver.—No tubercle bacilli. A few thick bacilli and a few segmented bacilli stained blue.

CALF 1425. Virus H 60. "W.B."

Subcutaneous inoculation of culture derived from a single colony (No. 5) isolated from a glycerin-serum plate sown from Guinea-pig 2489.

Dose—50·0 milligrammes.

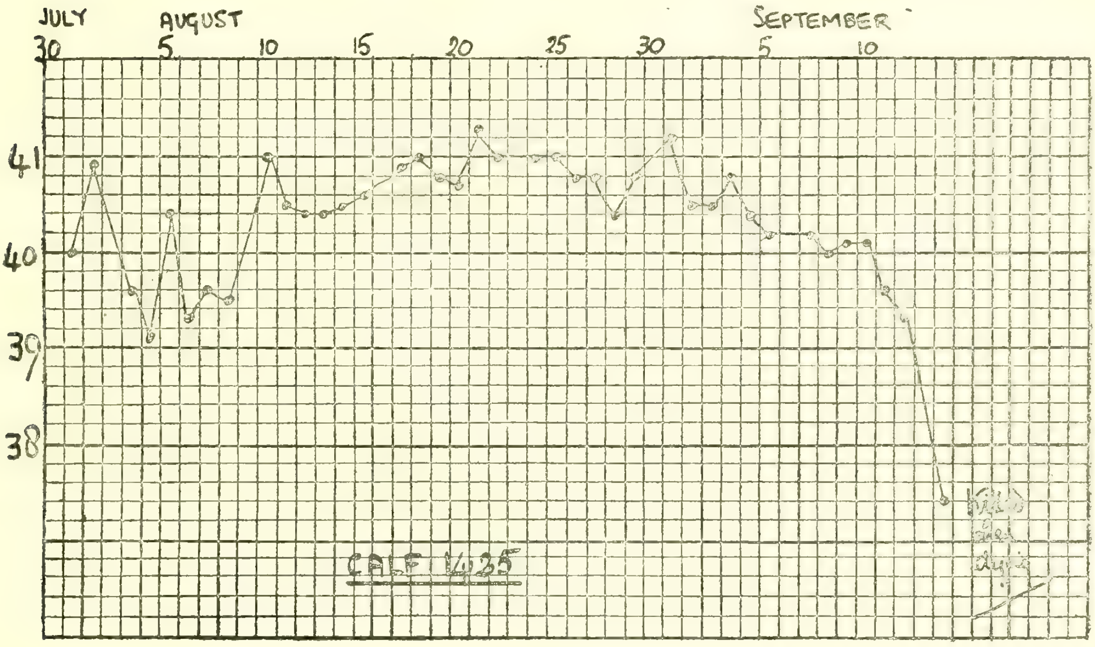
Date of Inoculation—July 30, 1908. [Age about 19 weeks.]

Killed when dying—September 14, 1908. [46 days after inoculation.]

Clinical Notes.

The course of the disease was similar to that usually seen in calves inoculated with virulent viruses.

Temperature.



Weights.

	cwt.	qrs.	lbs.
July 30, 1908	1	2	17
September 14, 1908	1	0	22

Total loss of weight.—1 qr. 23 lbs.

Average rate of loss per week.—7·7 lbs.

POST-MORTEM EXAMINATION.

The carcass was thin.

Local Lesion.—The tumour at the seat of inoculation on the left side of the neck was very large : the left prescapular gland was incorporated with it : the mass weighed 3 lbs. 15 ozs. ; the tissues surrounding it were very oedematous.

The tumour alone was pear-shaped measuring 20·5 cm., by 14 cm. in its widest part, by 7 cm. On section the central part was composed of firm pink caseo-necrotic substance in two places commencing to break down ; above it the skin was thickened and infiltrated right up to the surface with caseating areas ; below it there was a mass of infiltrated muscle.

Left Prescapular Gland.—The left prescapular gland was very large measuring 10 by 6·5 by 5·5 cm. On section it was composed throughout of firm caseo-necrotic substance and showed two small crescent-shaped cavities containing fluid.

Right Prescapular Gland.—The right prescapular gland measured 4 by 2 by 1 cm. and contained four congested caseous tubercles up to 2 mm. in diameter.

Left Prepectoral Glands.—The rounded prepectoral gland was the size of a thrush's egg, and was caseating throughout. The kidney-shaped gland measured 4 by 3 cm. It was composed of glandular tissue thickly peppered with irregular whitish tubercles often confluent. A smaller gland adjacent to it was similar.

Right Prepectoral Glands.—One contained a single caseous tubercle, the others appeared normal.

Left Cervical Glands.—One mid-cervical gland was enlarged and in an early stage of caseation. Another contained caseous tubercles.

An upper cervical gland was enlarged and oedematous, and showed caseous tubercles in the cortex.

Right Cervical Glands.—A mid-cervical gland contained two millet-seed sized yellow tubercles with congested margins. An enlarged upper cervical gland contained two similar tubercles.

Axillary Glands.—Each contained one hemp-seed sized congested caseous nodule.

Thorax.

Pleura.—Between the 7th and 8th ribs on the left side, close to the vertebra, there was a flattened loosely-attached fibro-caseous nodule 7 mm. in diameter. Two other smaller nodules were seen on this side, and there was one situated between the 5th and 6th ribs on the right side. Four were seen on the pleural surface of the pericardium, the largest 7 mm. in diameter.

Diaphragm.—On the pleural surface the villous tufts were hypertrophied and a few opaque foci could be seen in them.

On the peritoneal surface there were a few small scattered yellow tubercles.

Lungs.—The lungs were heavy and voluminous, and weighed 5 lbs. 1 oz. The surfaces were thickly covered with irregular tubercles with grey translucent margins and large irregular yellow centres ; these were frequently confluent forming patches up to 1 cm. in diameter. The tubercles varied in size from a pin-head upwards to a hemp seed. On the posterior and dorsal portions of the caudal lobes they were less numerous than elsewhere. On the surface of the anterior and middle lobes there were large and small dark red areas ; the right middle lobe was almost entirely dark red. The posterior lobes showed numerous little irregular reddish patches frequently surrounding a tubercle or a group of tubercles.

On section the tubercles were equally numerous; in the consolidated portions of the anterior and middle lobes they were especially thickly packed. The right middle lobe was consolidated almost throughout and sank in water; the other anterior lobes still contained a good deal of air-containing tissue. The right posterior lobe showed small irregular consolidated areas similar to those on the surface, but there was a large amount of air-containing tissue, and the tubercles were less numerous than elsewhere. The left posterior lobe was similar on section to the anterior lobes.

The tubercles were almost entirely caseating. They were frequently confluent, but no large patches were seen.

Thoracic Glands.—The bronchial and mediastinal glands were much enlarged, and weighed altogether 7 ozs. The surrounding tissues were very oedematous. The long mediastinal gland measured 12 by 4·5 by 1·5 cm. On section they were caseating almost throughout, very little gland tissue remaining; the right bronchial was entirely caseated, and similar to the left prescapular.

Heart.—Normal.

Abdomen.

Omentum.—The omentum contained several nodules, some loosely attached; the largest measured 0·6 cm. in diameter, and was composed of caseo-calcareous substance in a fibrous capsule; the others were fibro-caseous.

Parietal Peritoneum.—Normal.

Spleen.—The spleen was slightly enlarged and packed with yellow caseating tubercles from 1 to 2 mm. in diameter.

Liver.—On the surface of the liver there were numerous whitish-yellow tubercles, the majority dimly seen through the capsule. A few of the largest were flattened on the surface and had slightly overhanging margins; one measured 9 mm. by 4 mm., another 4 mm. in greatest diameter. Section showed the tubercles to be evenly and moderately thickly distributed throughout the substance of the liver. They were firm and caseous, and varied from 1 to 2 mm. in diameter.

Portal Glands.—The portal glands were enlarged and oedematous, the largest measuring 5 cm. in long diameter. On section they were packed with confluent caseating nodules, indefinite in outline.

Coeliac Glands.—The coeliac glands were similar to the portal.

Kidneys.—Twenty-five yellowish-white tubercles were counted on the surface of the right kidney, some slightly raised, others dimly seen through the capsule. They measured from 1 to 2 mm. in diameter. Similar tubercles were seen here and there in the substance of the kidney. The left kidney was similarly affected, 21 tubercles being counted on the surface.

Suprarenal Bodies.—The left showed four yellow tubercles up to 2 mm. in diameter; the right contained one.

Alimentary Tract.

Tongue.—Normal.

Tonsils.—The left contained one millet-seed sized caseating tubercle. The right was normal.

Pharynx.—The corrugated mucous membrane at the back of the pharynx showed six congested caseous tubercles up to a millet seed in size.

Larynx.—There were four yellow congested tubercles in the larynx.

Trachea.—The trachea appeared normal.

Submaxillary Glands.—Each contained two or three yellow caseous tubercles with congested margins.

Retro-pharyngeal Glands.—Each contained a moderate number of congested caseous tubercles in the cortex.

Intestines.—The small intestine was normal. In the caecum there were two small opaque submucous tubercles with congested margins; when picked out they were found to be caseous.

Mesenteric and Ileo-colic Glands.—Most of the mesenteric and ileo-colic glands contained scattered caseous foci.

Testicles.—Normal.

Various Lymphatic Glands.

Lumbar and Renal.—These glands were packed with caseating tubercles.

Ileo-Sacral.—The ileo-sacral gland contained several caseating nodules.

Iliac.—Two iliac glands contained each about a dozen caseous nodules up to a hemp seed in size.

Precrural and Popliteal.—Each contained about half a dozen similar caseous nodules.

Pudic.—The one on the left side contained three, that on the right four, caseous nodules.

Ischiatic.—The left contained a caseous tubercle, the right was normal.

Gluteal.—The right contained half a dozen small congested caseous tubercles. The left contained two caseous nodules.

CALF 1489. Virus H 90. "I.P."

Subcutaneous inoculation of culture derived from the pudic gland of Calf 1383.

Dose—50·0 milligrammes.

Date of Inoculation—November 25, 1908. [Age about 6 months.]

Died—January 6, 1909. [42 days after inoculation.]

Clinical Notes.

The course of the disease was like that usually seen after the inoculation of a fatal dose of a virus virulent for bovines, being characterised by weakness, emaciation, and increasing difficulty of respiration.

Temperature.

The temperature was raised and irregular during the week following the inoculation; 40·8°C. was reached on the 10th day, and the temperature was very high during the following 18 days (maximum 41·3°C., minimum 40·6°C.); it then slowly fell, and 38·6°C. was recorded on the day the animal died.

Weights.

	cwt.	qrs.	lbs.
November 25, 1908	2	0	15
January 6, 1909...	1	2	16

Total loss of weight.—1 qr 27 lbs.

Average rate of loss per week.—8 lbs.

POST-MORTEM EXAMINATION.

The carcass was emaciated.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a slightly raised tumour fluctuating in the centre measuring 15 by 7 by 3·5 cm.; on section it was composed of a subcutaneous mass of pinkish-yellow caseo-necrotic substance infiltrating the skin and the muscles, and containing in the centre a ragged cavity filled with yellow serous fluid. The tumour was attached to the nearest glands by thick caseous cords.

Left Prescapular Gland.—The left prescapular gland measured 8·5 by 6 by 4·5 cm. and was composed throughout of dense yellow caseo-necrotic substance; the capsule was thickened and in places (i.e. where joined by the caseous cords) infiltrated with caseous substance.

Right Prescapular Gland.—The right prescapular gland measured 4 by 1·7 by 1 cm., and showed in the cortex four caseous nodules, the largest 3 mm. in diameter.

Prepectoral Glands.—On the left side one 1·3 cm. in greatest diameter was indurated and yellow and caseous almost throughout. Another, disc-shaped and 4 cm. in greatest diameter, was firm grey and showed early foci of caseation. Another small one was in a similar condition.

On the right side two contained altogether five caseous nodules up to 2 mm. in diameter.

Cervical Glands.—On the left side at the root of the neck there was a large gland measuring 4·5 cm. in greatest diameter which was dense and caseating practically throughout. Other cervical glands were congested and contained each two or three caseous nodules with congested margins, the largest 2·5 mm. in diameter.

Axillary Glands.—In the left there was one caseous tubercle, in the right there were about half a dozen up to 2 mm. in diameter.

Thorax.

Lungs.—The lungs filled the chest and were very heavy weighing 11 lbs. 4 ozs. and all the lobes were extensively hepatized, dark red in colour and engorged with blood; in the posterior parts of the caudal lobes and around the margins of the cephalic there was some air-containing tissue, but this was firmer than normal and deeply congested; the parenchyma of the lungs was closely beset with yellowish-white caseous tubercles the majority about 1 mm. in diameter; a few were larger and here and there some had coalesced; the tubercles under the pleura of the anterior lobes and parts of the caudal projected slightly and were flattened out to a larger diameter than those in the depths.

Thoracic Glands.—The bronchial and mediastinal glands were greatly enlarged weighing together 12 ozs.; on section their cortices were composed of firm pinkish-grey tissue mottled with irregular yellow caseous patches and foci.

Pleura.—The fringes along the margins of the ribs were slightly hypertrophied and deeply congested; they contained sparsely scattered flattened caseating nodules varying up to 3 mm. in diameter. The diaphragmatic pleura showed a few small flattened nodules and congested villous patches.

Heart and Pericardium.—The heart muscles and valves were normal. There was a hemp seed-sized caseous pedunculated nodule on the surface of an auricle.

Abdomen.

Omentum and Peritoneum.—On the ventral surface of the omentum there were about half a dozen lenticular caseating nodules with congested margins the largest 5 mm. in diameter.

The parietal peritoneum was normal.

Spleen.—The pulp was soft and moderately closely beset with yellow caseous nodules the largest 3 mm. in diameter.

Liver.—The liver was much enlarged yellowish in colour and very friable; the substance contained moderately numerous evenly distributed tubercles ranging from about 0·5 to 2· mm. in diameter, the larger ones were yellow and caseous with grey margins, the smaller ones grey with opaque centres; on the surface there were a few flattened mushroomed nodules.

Portal Glands.—The portal glands were enlarged; their cortices were composed of grey caseating nodules closely aggregated together; in the central parts of the glands the nodules were more discrete.

Kidneys.—In the cortex of each kidney on the surface as well as on section there were scattered caseous nodules ranging from 1· to 2·5 mm. in diameter.

Suprarenal Bodies.—In the cortex of the right there were two greyish-white miliary tubercles. The left was normal.

Coeliac Glands.—The coeliac glands were enlarged and composed throughout of confluent grey nodules in a state of early caseation.

Lumbar and Renal Glands.—The lumbar and renal glands were enlarged and closely beset with caseating nodules.

Alimentary Tract.

The Tongue, Pharynx, Larynx, and Trachea were congested, but no tubercles were seen.

Tonsils.—One tonsil contained a caseous nodule 3 mm. in diameter.

Intestines.—Some of the Peyer's patches in the small intestine contained a few miliary caseous tubercles.

The Mesenteric and Ileo-colic Glands showed in the cortex each a few grey caseating patches some 1 cm. and more in diameter.

Testicles.—Normal.

Various Lymphatic Glands.

The Precrural, Popliteal, Iliac, Submaxillary, Parotideal, and Retro-pharyngeal Glands contained a varying number of discrete caseating nodules in the cortex the largest 3 mm. in diameter, the iliac and submaxillary containing a moderate number.

CALF 1493. Virus H 90. "I.P."

Subcutaneous inoculation of culture derived from the bronchial gland of Calf 1471.

Dose—45·0 milligrammes.

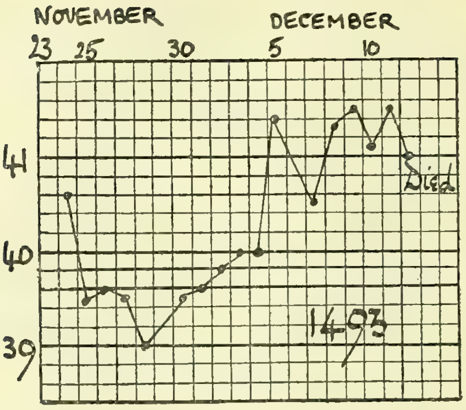
Date of Inoculation—November 23, 1908. [Age about 6 months.]

Died—December 14, 1908. [21 days after inoculation.]

Clinical Notes.

The illness was of the acute type frequently seen after the inoculation of virulent viruses.

Temperature.



Tuberculin Test.

The calf was not tested subsequent to inoculation.

Weights.

	cwt.	qrs.	lbs.
November 23, 1908	1	3	11
December 14, 1908	1	2	3

Total loss of weight.—1 qr. 8 lbs.

Average rate of loss per week.—12 lbs.

POST-MORTEM EXAMINATION.

The carcass was emaciated.

Local Lesion.—In the subcutaneous tissues on the left side of the neck there was a lenticular mass of yellow caseo-necrotic substance measuring 10 by 8 by 2 cm., infiltrating the skin to a slight extent and the muscles in one place rather deeply.

Left Prescapular Gland.—The left prescapular gland measured 9 by 5 by 3 cm., and was dense yellow and caseous practically throughout.

Right Prescapular Gland.—The right prescapular gland measured 5 by 2 by 1 cm., and showed scattered minute tubercles on section.

Prepectoral Glands.—On the left side one 2 cm. in diameter was caseous throughout, another larger flat gland showed the cortex grey and in a state of early caseation; another gland contained discrete tubercles. The glands on the right side contained scattered minute tubercles.

Cervical Glands.—One in the middle of the neck on the left side, the size of a thrush's egg, was firm and in a state of early caseation; the other cervical glands were deeply congested and showed scattered tubercles, as in the peripheral glands.

Thorax.

Pleura.—The fringes along the margins of the ribs were slightly hypertrophied and deeply congested; no tubercles were seen.

Lungs.—The lungs did not collapse and filled the chest; they were heavy, weighing 9 lbs. 14 ozs., and with the exception of the postero-dorsal parts of the caudal lobes, which were still air-containing, were dark-red and solid, portions sinking in water; the parenchyma of the lungs was everywhere very closely beset with minute grey tubercles.

Thoracic Glands.—The bronchial and mediastinal glands were enlarged, deeply congested, and showed in the cortex grey patches composed of aggregated grey tubercles and discrete grey miliary tubercles.

Heart.—The cavities of the heart were filled with red blood-clot; the endocardium of the right auricle and right ventricle showed a few small caseous tubercles. The pericardium was normal.

Larynx and Trachea.—The mucous membrane of the larynx and trachea was congested.

Abdomen.

Omentum.—There were four small tubercles on the omentum.

Peritoneum.—The peritoneum appeared normal.

Spleen.—The spleen was not enlarged; the capsule was wrinkled and the pulp was soft and seemed a little atrophied; it showed numerous not very conspicuous grey bodies, probably enlarged Malpighian bodies, which showed no sign of caseation.

Liver.—The liver was enlarged, pale and soft, and contained fairly numerous evenly distributed grey miliary tubercles.

Portal Glands.—The portal glands were not obviously enlarged. The tissue was oedematous and the cortex contained grey patches with early caseous foci.

Kidneys.—In the cortex of each kidney there were a few minute grey tubercles.

Suprarenal Bodies.—Normal.

Alimentary Tract.

Pharynx.—The mucous membrane of the pharynx was congested.

Tonsils.—The tonsils were congested, no tubercles were seen.

Intestines.—Some of the Peyer's patches of the small intestine showed a few greyish-white points. The large intestine was normal.

Mesenteric Glands.—No tubercles were seen.

Ileo-colic Glands.—A few tubercles were seen in one gland.

Testicles.—Normal.

Various Lymphatic Glands.

All the peripheral lymphatic glands showed in the cortex scattered opaque tubercles less than 1 mm. in diameter.

There were similar but more numerous tubercles in the coeliac, lumbar, and renal glands.

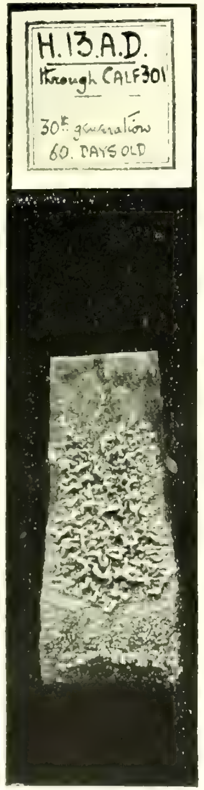
Microscopical Examination.

Smear from a focus in a Peyer's patch.—A few tubercle bacilli.

SUBCULTURES ON GLYCERINATED POTATO:—

(a) *Of the initial culture and some of the separated cultures of Virus H. 13. "A.D." (Calf 301 strain).*

(b) *Of the initial culture and some of the separated cultures of Virus H. 60. "W.B." (bronchial gland strain).*



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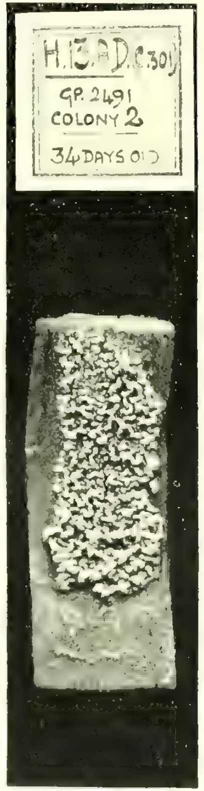

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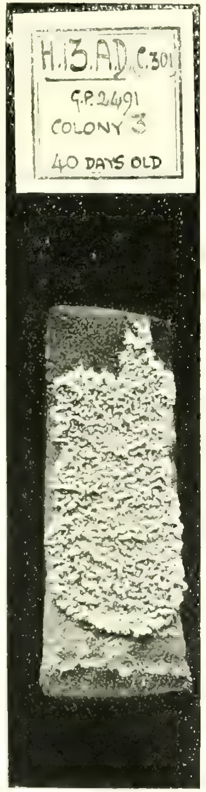

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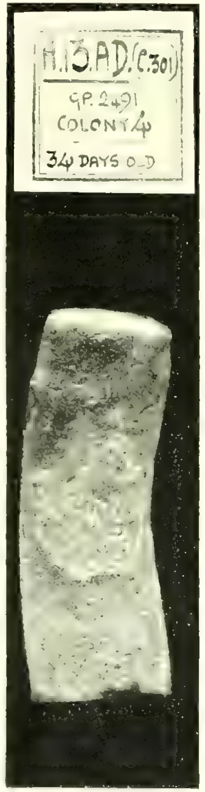

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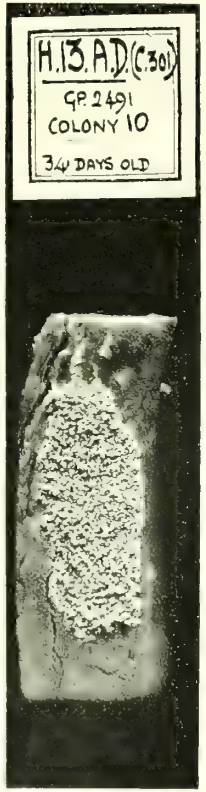

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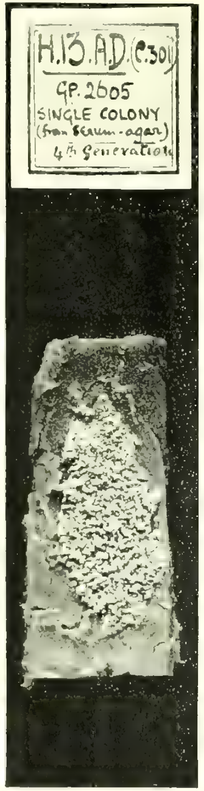

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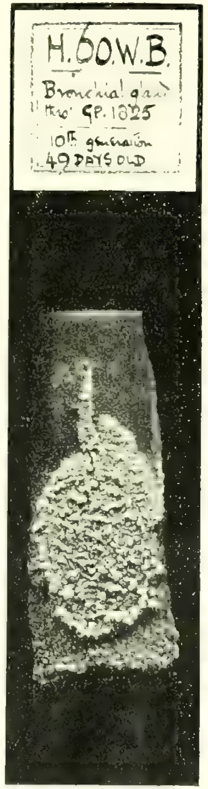

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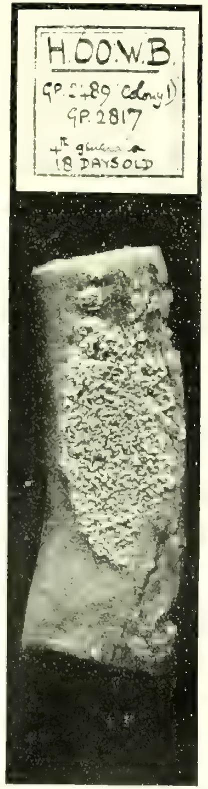

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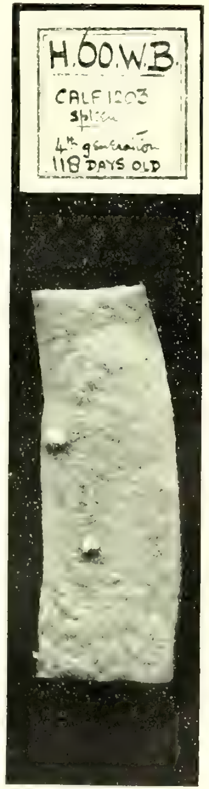

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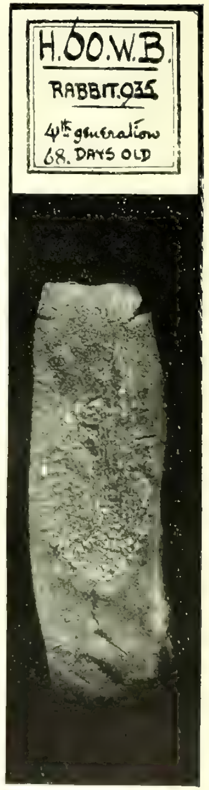


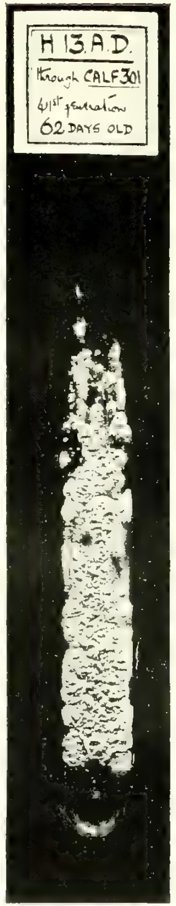
10.

No. 1. The growth produced by the initial culture (eugonic and virulent).
Nos. 2 and 5. Growths produced by colonies (Nos. 2 and 10) from a serum plate (eugonic and virulent). *See* Table D.
No. 3. The growth produced by a colony (No. 3) from a serum plate (eugonic and slightly virulent). *See* Table D.
No. 4. The growth produced by a colony (No. 4) from a serum plate (dysgonic and virulent). *See* Table D.
No. 6. The growth produced by a colony from a serum agar plate (eugonic and slightly virulent). *See* Table E.

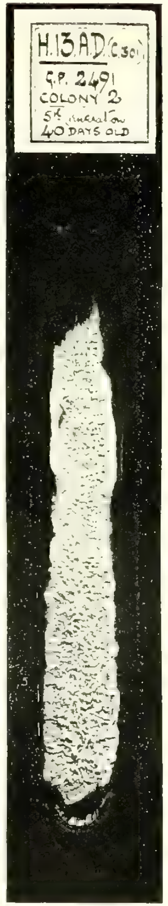
No. 7. The growth produced by the initial culture (eugonic and virulent).
No. 8. The growth produced by a single colony from a serum plate (eugonic and slightly virulent). *See* Table O.
Nos. 9 and 10. Growths produced by cultures isolated from animals inoculated with the initial culture (dysgonic and virulent). *See* Tables M and N.

SUBCULTURES ON GLYCERIN AGAR:—

(a) *Of the initial culture and some of the separated cultures of the Virus H. 13. "A.D." (Calf 301 strain).*



1.



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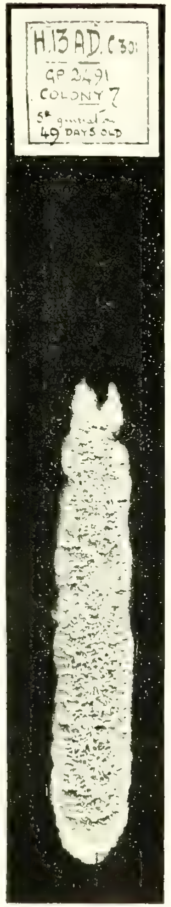

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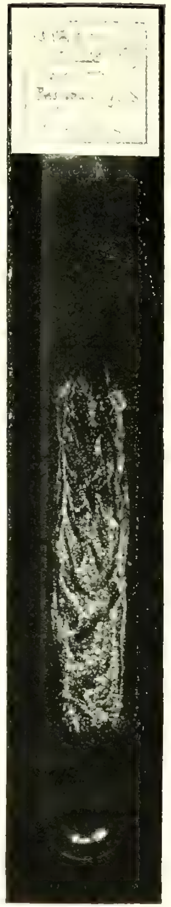

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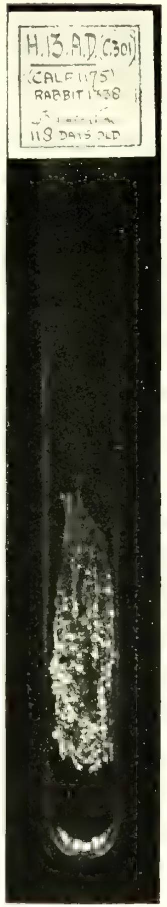

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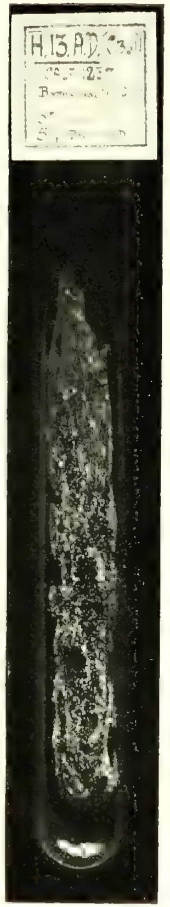
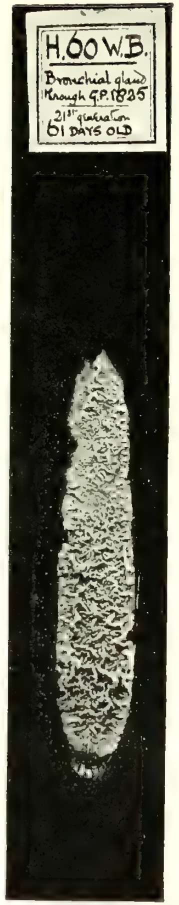


6.

(b) *Of the initial culture and two of the separated cultures of the Virus H. 60. "W.B." (bronchial gland strain).*



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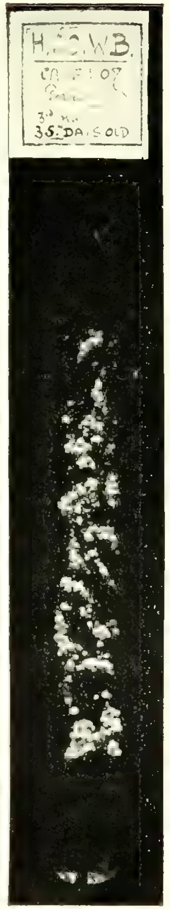

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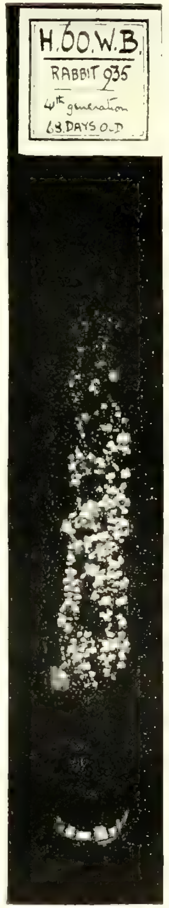
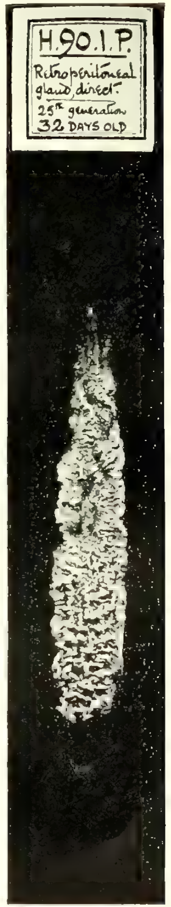


9.

(c) *Of the initial culture of the Virus H. 90. "I.P." (retroperitoneal gland strain).*



10.

No. 1. The growth produced by the initial culture (eugonic and virulent).

Nos. 2 and 3. Growths produced by colonies (Nos. 2 and 7) from a serum plate (eugonic and virulent). *See* Table D.

Nos. 4, 5, and 6. Growths produced by cultures isolated from passage animals (dysgonic and virulent). *See* Table A.

No. 7. The growth produced by the initial culture (eugonic and virulent).

Nos. 8 and 9. Growth produced by cultures isolated from animals inoculated with the initial culture (dysgonic, No. 9 virulent). *See* Tables L and M.

No. 10. The growth produced by the initial culture (eugonic and virulent).

REPORTS ON THE EXCRETION INTO THE MILK OF COWS AND GOATS, AND INTO THE MILK SINUSES OF THE UNDEVELOPED UDDERS OF HEIFERS, OF TUBERCLE BACILLI WHICH HAD BEEN SUBCUTANEOUSLY OR INTRAVENOUSLY INOCULATED.

BY

A. STANLEY GRIFFITH, M.D.

THE EXCRETION OF TUBERCLE BACILLI IN MILK.

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Part I.

THE EXCRETION OF TUBERCLE BACILLI INTO THE MILK OF COWS AND GOATS.

INTRODUCTION.

In spite of numerous observations on naturally tuberculous cows, it has not yet been definitely settled whether the normal udder will permit the passage of tubercle bacilli from the blood-stream into the milk.

Positive results have been obtained by many investigators with milk from tuberculous cows in which no disease of the udder could be detected either macroscopically or microscopically, but these cannot be accepted as proof that the bacilli were excreted in the milk directly from the blood-stream, since the bacilli may have been introduced accidentally while collecting the samples or have escaped into the milk from some early and undetected tuberculous lesion in the udder.

Accidental contamination can be avoided, and has been in the more recent experiments in which positive results have been obtained, but it is doubtful whether any examination can be so exhaustive as definitely to exclude the presence of early lesions in the udder.

It seemed to me, therefore, that the question whether tubercle bacilli can pass from the blood into the milk without producing changes in the mammary tissue could be solved only by direct experiment, *i.e.* by introducing tubercle bacilli into the blood-stream of a healthy cow and testing her milk at short intervals subsequently. If such experiment showed that tubercle bacilli so introduced were excreted in the milk within a short period after their inoculation into the blood-stream there would arise strong presumption that a similar excretion takes place during the progress of a natural infection.

A preliminary experiment was therefore made at Walpole Farm with a culture of bovine tubercle bacilli. A cow was inoculated subcutaneously with 100·0 milligrammes of culture, and her milk tested at intervals after the inoculation produced tuberculosis in guinea-pigs. The subcutaneous method of inoculating the cow was chosen instead of the intravenous, as it was anticipated that the latter method of inoculating bovine tubercle bacilli would cause the too speedy death of the animal, and as it had been shown that after subcutaneous inoculation there is an immediate and for several days a rapid escape of bacilli into the blood-stream.

It was inferred from the results of the guinea-pig inoculations in this experiment that the milk of a tuberculous cow is liable to contain tubercle bacilli whenever tubercle bacilli gain access to the general circulation.

This experiment (Experiment A) has already been fully reported (Appendix to the 2nd Interim Report, Vol. I, pp. 35 and 226) but for convenience of reference the details have been reproduced in this report.

In order to ascertain whether a similar excretion takes place after the inoculation of tubercle bacilli possessed of slight virulence for the calf, a series of three cows and six goats has been inoculated and the milk of these animals tested frequently at short intervals subsequently; in addition a goat has been inoculated with a culture of human origin but exhibiting bovine characters.

The clinical histories and post-mortem notes of these animals, and the results of the inoculation of their milk, are fully detailed in this report.

All the animals previous to their inoculation had been tested with tuberculin and their milk inoculated into guinea-pigs; the results in all cases were negative.

Technique.

The milk of the first two cows (300 and 77) was collected by hand; the teats, udder and surrounding skin were carefully cleansed and then washed in a 1 in 1,000 solution of mercury perchloride; finally the teats and udders were washed with alcohol; the first few drops of milk were rejected and in the case of the first two cows the samples for inoculation were received into sterile glass bottles held at an angle to avoid as far as possible the entrance of chance particles of dust.

The milk from the other animals, with the exception of Goat 81, was obtained by catheterisation, the same precautions as to cleanliness of the udder and surrounding skin being observed as with the first two cows.

In all cases the milk was collected by me or by a skilled attendant under my direct supervision. In every case the udder was milked dry just before the animal was inoculated, and whenever samples were taken no milk had been withdrawn during the previous twenty-four hours.

The amount of milk inoculated into the guinea-pigs varied. Sometimes the milk was centrifuged with a hand centrifuge and the deposit was suspended in uncentrifuged milk for the purposes of inoculation, but in the large proportion of cases the milk was uncentrifuged, the dose varying from 0·5 or 1·0 cc. up to 30·0 cc. In the first two experiments the dose in nearly every case was 5·0 cubic centimetres of uncentrifuged milk ; in the others the dose was generally 10·0 cubic centimetres.

Experiment A.

Cow 300 was inoculated subcutaneously in the neck on September 2, 1905, with 100·0 mg. of a bovine culture and her milk tested on guinea-pigs subsequently at intervals of 7, 16, 21, 28 and 30 days after her inoculation ; also two pigs were fed with her milk for a week.

The experiments on the guinea-pigs showed that the milk was capable of setting up tuberculosis at the end of the first week and on every subsequent occasion. The number of tubercle bacilli excreted in the milk did not appear to be large since most of the guinea-pigs developed only a mild type of disease and the swine though fed for a week with the milk did not become tuberculous.

The cow died of acute generalised tuberculosis in 30 days ; the udder was normal to the naked eye and no tuberculous lesions or tubercle bacilli were found on microscopical examination.

Experiment B.

Cow 77 was inoculated subcutaneously on November 28, 1906, with 100·0 milligrammes of culture derived from the original material of Virus H 68. " R.B." (a case of tuberculous osteitis) ; this culture grew luxuriantly on artificial media and was only slightly virulent for the calf and rabbit.

The general health of the cow was unaffected by the inoculation, and the local lesion which developed at the seat of inoculation diminished greatly in size and was represented finally by a small patch of thickening. The cow, which was killed in good health 156 days after inoculation, showed at the post-mortem examination a fibrous local lesion, a caseo-purulent nodule in the prescapular gland, but no sign of tuberculosis elsewhere. Each quarter of the udder was examined histologically by Dr. Eastwood but no tuberculous lesions or tubercle bacilli were found.

Throughout the first week of the experiment a series of eight guinea-pigs was inoculated every twenty-four hours, then for twelve weeks a series of eight at intervals of about a week ; the last two series were inoculated after 112 and 155 days, and each included twelve guinea-pigs.

Altogether seventeen series, comprising 144 animals, were inoculated. Each guinea-pig in the first fifteen series received 5·0 cc. of milk ; two were inoculated from each quarter, one subcutaneously and one intraperitoneally. In the sixteenth series eight of the guinea-pigs received 5·0 cc. of milk, the other four each got the centrifuged deposit of 100·0 cc. For the last series the whole of the milk yielded during twenty-four hours was centrifuged, and the deposit from each quarter inoculated into three guinea-pigs.

In all but two of the series (*i.e.* the fifth, in which none of the animals became tuberculous, and the tenth, in which the one animal which was affected had spontaneous tuberculosis) one or more of the guinea-pigs inoculated developed definite inoculation tuberculosis. Of the first day's milk, *i.e.* that secreted during the 24 hours after inoculation of the cow, that from two of the quarters only proved infective ; on the second and third days milk from all the quarters produced tuberculosis. From the end of the third week to that of the thirteenth, one, or at most three, of the guinea-pigs in each series became tuberculous. In the last series of twelve guinea-pigs, which were inoculated with centrifuged deposit, one from each of three quarters and two from the other became tuberculous.

Two rabbits were inoculated, one subcutaneously and one intraperitoneally, with mixed milk taken from all the quarters just before the cow was killed. They were killed 92 days later, the subcutaneously inoculated rabbit showing a local lesion and one tubercle in the lung, the intraperitoneally inoculated rabbit three or four tubercles in the omentum, one in a kidney, and one in the lung.

In order to ascertain whether the tuberculosis in the guinea-pigs in the last three series was produced by bacilli of like kind with those inoculated into the cow, ten rabbits were inoculated with emulsions of the organs of eight guinea-pigs and in addition a culture was isolated from each of these guinea-pigs.

Three of the rabbits died prematurely, the others showed slight retrogressive tuberculosis All the cultures isolated grew luxuriantly on the test media. The properties of the bacilli excreted in the milk were therefore precisely those of the bacilli inoculated under the skin of the cow.

EXPERIMENT C.

Cow 61 was inoculated subcutaneously on August 6, 1907, with 100·0 milligrammes of a slightly virulent culture obtained from a tuberculous lung (Virus H 81. "P.W."). She was an old cow and was giving only a very small amount of milk ; her last calf had been born on October 15, 1905. One of the quarters of her udder, the right fore, was atrophied, and had for some time yielded only a small quantity of serous fluid and yellow clots in which numerous streptococci were demonstrated.

Nine series of guinea-pigs were inoculated with the milk, three series in the first week after her inoculation, the last series after eighty-four days. Only one of the guinea-pigs became tuberculous. This guinea-pig was one of the series inoculated on the seventh day and had received intraperitoneally 10·0 cc. of fluid obtained by filtering clots which had been withdrawn by hand from the right fore quarter. A culture isolated from the guinea-pig grew like the culture inoculated into the cow.

Ninety days after the subcutaneous inoculation the cow was inoculated intravenously with 150·0 milligrammes of culture from Virus H 83. "G.C.," a slightly virulent culture obtained from the spleen of a child who died of general tuberculosis. A series of guinea-pigs was inoculated with her milk every day (except on the fourth) during the first eight days, then on the tenth, twelfth, fifteenth and forty-fourth days, and one guinea-pig on the eighty-fifth day. All the guinea-pigs, fourteen in number, inoculated one and two days after the inoculation of the cow, became tuberculous ; in the third series four out of the six developed tuberculosis ; and the milk continued to be infective up to the forty-fourth day, the single guinea-pig inoculated on the eighty-fifth day remaining healthy.

Cultures were isolated from seven of the tuberculous guinea-pigs, and these all exhibited the cultural characters of the bacillus intravenously inoculated.

As in Cow 77, an irregularity in the infectivity of the milk was observed ; of a pair of guinea-pigs inoculated from the same quarter one would be found tuberculous, the other healthy, and the milk from a quarter which produced tuberculosis on one occasion would on the next fail to do so.

By the 85th day, that is on January 28, 1908, the secretion of milk had practically ceased and the routine inoculations of guinea-pigs was discontinued.

The milk had been examined microscopically for tubercle bacilli on several occasions during the first ten days after the cow was intravenously inoculated, but none was demonstrated in it.

From January 28 to April 14, 1908, the udder of the cow was not meddled with.

On the latter date (162 days after the intravenous inoculation) the two fore-quarters were milked and some pus was obtained from each ; smear preparations from the pus showed in each case very numerous tubercle bacilli, the majority being long and beaded ; there were numerous cells, mainly polymorphonuclears with scattered lymphocytes and alveolar cells.

On the following day 50·0 cc. of sterile salt solution were injected into each of the two fore-quarters, and after manipulating the quarters with the object of forcing the fluid into the smaller ducts, as much as possible was recovered by means of the apparatus which had been used for injecting the salt solution ; only a small quantity of the fluid was recovered, and this was slightly milky and contained small flakes and flocculi ; smear preparations of this fluid showed numerous tubercle bacilli.

Subsequent microscopical examinations of the fluids which collected in the milk sinuses were made at intervals.

The following table gives the results of these examinations on and after April 14, 1908 :—

Date.	Quarter of Udder.	Description of Material.	Result of Examination.
April 14, 1908	L.F. R.F.	Pus	Numerous T.B. Cells mainly polymorpho-nuclears ; scattered lymphocytes and alveolar cells.
April 15, 1908	L.F. R.F.	Fluid recovered after injecting salt solution.	Numerous tubercle bacilli.
April 21, 1908	L.H. R.H.	Pus	Fairly numerous T.B., definitely less numerous than in the fore quarters.
June 2, 1908	L.F. R.F.	A few drops of pus	T.B. numerous.
July 1, 1908	Mixed fluids from all the quarters.	Yellow muco-purulent fluid.	T.B. numerous.
July 17, 1908	L.F. R.F.	A few drops of purulent fluid.	T.B. numerous.
	L.H.		
	R.H.	„ „ „	A few clumps of very short T.B., quite different from those in the other quarters.
August 6, 1908	L.F. R.F. L.H.	Pus	T.B. fairly numerous, but distinctly less numerous than when first examined in April
Sept. 15, 1908	L.F.	Yellow muco-pus with small flakes.	A moderate number of tubercle bacilli.
	R.F. L.H.	Yellow muco-pus Thick tenacious yellow pus.	Scattered beaded T.B. and a few clumps.
	R.H.	Milky watery fluid	A few small groups of very short acid-fast bacilli and granules ; the cells were chiefly polymorpho-nuclears.
October 6, 1908	L.F. R.F.	Yellow tenacious muco-pus. Serous fluid containing small whitish flakes	T.B. moderately numerous.
	L.H.	Thick yellow tenacious pus.	T.B. rather more numerous than in the fore quarters.
	R.H.	Muco - purulent substance and serous fluid.	One T.B. and a few groups of acid-fast granules.
October 15, 1908	L.F.	Yellow pus	T.B. moderately numerous.
	R.F. L.H.	Yellow pus in which a calcareous grain was found. Yellow pus	T.B. in moderate numbers.
	R.H.	Milky fluid on which on standing a layer of cream formed.	A few small groups of short acid-fast bacilli ; many short chains of cocci.
January 14, 1909	L.F.	Yellow pus, thick and tenacious.	T.B. moderately numerous.
	R.F.	Watery fluid with whitish flakes.	Scattered T.B. seen.
	L.H.	Yellow pus, thick and tenacious.	A moderate number of T.B. seen.
	R.H.	Turbid watery fluid with flakes of yellow pus.	No T.B. seen.
April 15, 1909	L.F.	Yellow pus	Numerous long and beaded T.B.
	L.H.	„ „	A moderate number of T.B.
	R.H.	„ „	A few acid-fast granules only were seen.

Towards the end of June, 1908, that is nearly eight months after her intravenous inoculation, it was observed that three of the quarters of the cow had become enlarged and somewhat indurated, and that there was a sero-purulent discharge from the two fore teats. A fortnight later there was a distinct increase in the size of the three quarters; the left fore and the left hind were uniformly indurated, the right fore was indurated and nodular; the right hind showed no alteration in size.

On July 1, 1908, each of the quarters was milked dry because it was noticed that three of the sinuses were becoming distended. Altogether 450·0 cc. of yellow tenacious muco-purulent fluid was withdrawn; there was practically none in the right hind quarter. With the exception of the few drops required for microscopical examination nothing had been withdrawn from the udder for six months.

On the next day 250·0 cc. were obtained, and on the next 100·0 cc.; the latter was more serous than the first, but still very turbid.

Subsequently the amount of discharge rapidly became less and after July 17 small quantities only of pus were obtained.

After attaining its maximum size on or about July 1, the udder underwent no appreciable alteration for some time; on October 15, 1908, it was thought to be on the whole a little smaller; the quarters on the left side were each larger than the right fore and were uniformly very knotty and indurated; the right fore was less uniformly indurated and could be resolved more easily into separate nodular or knotty areas; the right hind was small and atrophic and no nodules were felt in it. Subsequent to this date there was a gradual diminution in the size of the organ, and it was found on April 15, 1909, the day before the cow was killed, when an attempt was made to wash out the quarters, that the milk sinuses of two of the quarters were much contracted and the ducts apparently obliterated, and in the case of one of the quarters it was impossible to insert the cannula on account of the teat canal being filled with a firm cheesy substance.

The cow was killed on April 16, 1909, 529 days after the intravenous inoculation; the post-mortem examination showed in the caudal lodes of the lungs a few dense or softened caseous and calcareous nodules of various sizes, a large fibro-caseous mass with two small nodules in the long mediastinal gland, gritty caseous nodules in the suprarenal bodies, caseo-purulent nodules in the pancreas and tuberculosis of the udder which was atrophied and fibroid (*see* page 109). There was no lesion at the site of the subcutaneous inoculation and the adjacent prescapular gland was normal.

The virulence of the tubercle bacilli in the milk sinuses has been tested by the inoculation into rabbits both of the fluids recovered from the quarters after injecting saline and of cultures obtained direct from the purulent discharge.

Thus:—Washings from the quarters have been inoculated into rabbits on three separate occasions, on April 15, and October 15, 1908, and on April 15, 1909, and in each series of rabbits slight tuberculosis only was produced. And cultures of tubercle bacilli have been obtained direct from the pus of the mamma of the cow on four separate occasions, on April 15, August 6, and October 7, 1908, and on April 15, 1909. All these strains have grown on the test media exactly like the culture intravenously inoculated, and three, including one isolated on April 15, 1909, have been shown to possess for the rabbit the low virulence of the original culture.

The bacilli from the milk sinuses had not, therefore, undergone any alteration in cultural characters and in virulence for the rabbit after a residence in the body of the cow of 528 days.

In the early part of the experiment streptococci were often demonstrated in the milk and were particularly numerous in the clots from the right fore quarter. On October 7, 1908, a culture tube sown with fluid from the right hind quarter became covered in 48 hours with streptococcus colonies. The cultures of tubercle bacilli obtained from the other quarters did not show any streptococcus colonies and no organisms other than tubercle bacilli had been demonstrated in smear preparations from these quarters during the period from April 14, 1908. The streptococci therefore had disappeared from those quarters in which there had been a multiplication of tubercle bacilli and had persisted in the single quarter which had not become affected with tuberculosis.

The positive results with the milk of this cow after tubercle bacilli had been inoculated directly into the blood-stream supplies a possible explanation of the negative results after the subcutaneous inoculation, namely that the subcutaneous inoculation was followed by only a slight dissemination of tubercle bacilli.

This slight dissemination of bacilli may have been due to the condition of the culture. It not infrequently happens that bacilli of Group II grow on serum very quickly and luxuriantly and then apparently rapidly lose their vitality; this loss in vitality is shewn in the difficulty sometimes experienced in obtaining subcultures (on serum) from such cultures when they are not more than three weeks or a month old.

The faeces of the cow were inoculated into sixteen guinea-pigs, six after the subcutaneous inoculation and ten after the intravenous. Seven guinea-pigs died shortly after inoculation, eight were killed and found to be healthy, one only became tuberculous. The guinea-pig that became tuberculous was inoculated ten days after the intravenous inoculation of the cow.

EXPERIMENT D.

Cow 565 was inoculated intravenously on February 18, 1909 with 10·0 milligrammes of a Group II culture obtained from a tuberculous human lung (Virus H 104. "E.R.")

The cow, 4½ years old, was about 4 months pregnant; one of her quarters was "dry."

The milk from the three functional quarters was inoculated into a series of six guinea-pigs, two from each quarter, every day during the first seven days (the first series being inoculated twenty-four hours after the inoculation of the cow), and again at the end of a fortnight; between the 14th and the 168th day seven series of guinea-pigs were inoculated, the intervals ranging from two to four weeks; in the last fortnight four series of guinea-pigs were inoculated.

In the first series of guinea-pigs, *i.e.* those inoculated with milk secreted during the first twenty-four hours of the experiment, only one animal became tuberculous. All the animals in the second, third, and fourth series remained healthy. In the fifth series there were two, in the sixth one and in the seventh four tuberculous animals. The milk from each of the three quarters withdrawn on the 14th day produced tuberculosis in one of each pair of guinea-pigs inoculated, the other remaining free from tuberculosis. Tuberculosis was not produced in any of the guinea-pigs inoculated subsequently.

Two pigs were fed for seven days with milk withdrawn during the period included between the second and the eighth days after the inoculation of the cow; they together received all the milk yielded with the exception of that used for the guinea-pigs. They were killed 97 days after the experiment began; one was healthy, the other showed a calcareous tubercle in one submaxillary gland.

In this case therefore persistence of tubercle bacilli in the milk sinuses was not demonstrated. The negative results do not however prove that the milk sinuses were free from bacilli since only a small proportion of the total amount of milk secreted was inoculated; tubercle bacilli were no doubt present in the milk secreted on the second, third, and fourth days but in such small numbers that the samples inoculated, $\frac{1}{70}$ to $\frac{1}{80}$ of the total yield, did not happen to include any. It is to paucity of bacilli and the inoculation of only a small proportion of the milk yielded that the irregularity of the results in those series in which some of the guinea-pigs became tuberculous is to be attributed rather than to intermittent discharge of bacilli into the milk. An inspection of the table on page 118 shows that frequently only one of the guinea-pigs inoculated with milk from the same quarter became tuberculous and that milk from a quarter which on one occasion produced tuberculosis was not on the next infective.

The cow 153 days after her inoculation gave birth to a dead foetus (eight months old); during parturition a large amount of thin purulent fluid was discharged from the uterus; microscopical examination showed this fluid to contain very numerous tubercle bacilli. During the next two or three days there was a slight discharge and on the sixth day some membranes and purulent fluid came away; numerous tubercle bacilli were again demonstrated in the fluid. The foetus showed no sign of tuberculosis and emulsions made from its spleen and a portal gland did not produce tuberculosis in guinea-pigs.

The cow was killed 182 days after inoculation; there was no sign of tuberculosis in any of her organs or glands but a few tubercle bacilli were found in smear preparations of scrapings from the mucous membrane of one cornu of the uterus.

Experiment E.

Goat 79 was inoculated subcutaneously on November 12, 1908, with 50·0 milligrammes of a lupus culture (H 110. "J.B." (*a*)) possessing all the properties of a culture of bovine tubercle bacilli, and was killed 9 days later.

The post-mortem examination revealed a local lesion, early caseation of the prescapular gland and moderately numerous small tubercles in the lungs; there was no sign of disease elsewhere.

When inoculated the goat was giving only a small quantity of milk and after inoculation she soon became "dry," no milk being obtained from the right half of her udder after the fourth day or from the left after the sixth day.

The milk withdrawn at intervals of twenty-four hours, during four days in the case of the right half of her udder and six days in that of the left, was inoculated into guinea-pigs. On the first and also on the second day four guinea-pigs were inoculated, two from each half of the udder, the doses varying from 10 to 4·5 cubic centimetres, but subsequently sufficient milk was yielded to inoculate only one guinea-pig from each half; the amount obtained from the left half of the udder on the fifth as well as on the sixth days was only 0·5 cubic centimetre.

Only one of the eight guinea-pigs inoculated with milk from the left side became tuberculous. Milk withdrawn from the right side twenty-four hours after inoculation did not produce tuberculosis, while that withdrawn on the second, third, and fourth days did.

Just before the goat was killed the milk sinuses of the udder were washed out with sterile salt solution, and a milky fluid was recovered from each side which was inoculated into two guinea-pigs. The two guinea-pigs inoculated with the fluid from the left half remained healthy while those from the right half became tuberculous.

Microscopical examinations of the milk on several occasions and of the recovered saline solution were negative as regards presence of tubercle bacilli.

In this experiment tubercle bacilli had passed out into the milk mainly from one half of the mamma and from that half which was giving the least amount of milk.

Experiment F.

Goat 55 was inoculated subcutaneously on November 14, 1907, with 50·0 milligrammes of culture* obtained from the mesenteric glands of an old man (Virus H 90. "I.P."), and was killed 103 days after. At the post-mortem examination there was a scar at the seat of inoculation with caseous nodules in the subcutaneous tissues around; both prescapular glands were caseous the left more than the right; one kidney contained a nodule; the mesenteric glands were tuberculous; and there were several miliary tubercles in the left quarter of the udder, and a caseating patch in the right.

During the first eight days guinea-pigs were inoculated with the milk at intervals of twenty-four hours; during the remaining period guinea-pigs were inoculated on the fourteenth, twenty-first, and seventy-fifth days only. In each series some or all the guinea-pigs developed tuberculosis; the milk from the left half of the udder was invariably infective, that from the right occasionally failed to infect. It is to be noted that the left quarter during life generally yielded less milk than the right, and the post-mortem examination showed in it a greater amount of tuberculosis.

Cultures isolated from two of the tuberculous guinea-pigs, Nos. 2736 and 2791, grew luxuriantly on the test media, and one (Guinea-pig 2791 strain) had low virulence for the rabbit.

Eight guinea-pigs were inoculated intraperitoneally each with 1·0 cc. of an emulsion of faeces prepared by diluting 1·0 cc. of thick filtered suspension to 20·0 cc. Four of the guinea-pigs died soon after inoculation; the other four were killed after several months and found to be free from tuberculosis.

Experiment G.

Goat 59 was inoculated subcutaneously on November 28, 1907, with 100·0 milligrammes of culture derived from the lung of a man (H 79. "J.N.") ; the culture was slightly virulent for the calf and rabbit, and grew luxuriantly on culture media.

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* When used for inoculation this culture was believed to be an ordinary slightly virulent human tubercle bacillus; there is now evidence to show that it contained a small proportion of virulent tubercle bacilli.

The goat was killed in good health 106 days after the inoculation, and showed a scar at the seat of inoculation with caseo-calcareous tubercles in the subcutaneous tissues around, caseation of the prescapular gland, some doubtful tubercles in the lung, a few tubercles in the spleen, and tuberculosis of the mesenteric and ileo-colic glands ; the udder appeared normal.

Guinea-pigs were inoculated with the milk every day except the third during the first six days. All these guinea-pigs, twenty in number, became tuberculous.

After the sixth day no further observations were made on the infectivity of the milk. At the time of inoculation the goat was giving a very small quantity of milk, and after the sixth day the amount rapidly diminished, and in a short time the secretion ceased altogether.

A culture isolated from one of the tuberculous guinea-pigs, No. 2797, grew like the culture inoculated into the goat.

EXPERIMENT H.

Goat 69 was inoculated subcutaneously on June 3, 1908, with 10·0 milligrammes of culture obtained from cerebro-spinal fluid (H 98. "B.R."). This culture grew luxuriantly on artificial media and had low virulence for the rabbit.

The milk of the goat was subsequently inoculated into a series of four guinea-pigs on the first, second, third, fifth, and seventh days during the first week, and then once a week for three weeks ; a final series was inoculated on the 44th day after the inoculation of the goat.

Altogether 36 guinea-pigs were used.

All the guinea-pigs inoculated with the milk withdrawn during the first week remained healthy ; all those inoculated on the 14th day (with one exception) and subsequently, developed tuberculosis.

In this case, therefore, the bacilli did not appear in the milk so quickly as in the other like experiments, probably because the dose was so much smaller.

The general health of the goat was good throughout the experiment. The amount of milk secreted in a day was never very large ; during the first month the daily yield varied from 100·0 to 300·0 cc. of which usually only 40·0 cc. were inoculated into guinea-pigs ; after the first month the secretion of milk gradually diminished and towards the end of the second month ceased altogether.

On July 15, 42 days after inoculation, the mamma of the goat was found to be enlarged ; on palpation the enlargement affected mainly the right half which was uniformly indurated and knotty ; the left half was not obviously enlarged but contained some hard nodules just above the teat ; the milk at this time was much diminished in amount but showed no alteration in quality ; later on the left half became more uniformly indurated ; during the latter part of the experiment the mamma remained indurated but decreased a little in size.

Microscopical examinations of the milk were made at intervals for the presence of tubercle bacilli.

One (?) tubercle bacillus was found in the centrifuged deposit of milk withdrawn on the second day from the right half of the mamma ; in centrifuged deposit of milk taken from the same side on the 14th day five tubercle bacilli were found ; other examinations were negative.

On the 42nd day a loopful or two of the milk from each half of the mamma was sown on to egg tubes ; pure cultures of the tubercle bacillus were obtained in each case, the colonies being more numerous on the tube sown with milk from the right quarter than on that sown with milk from the left. The cultures grew on glycerin media like the original.

The goat was killed 114 days after inoculation, and showed at the post-mortem examination an encapsuled caseous mass at the seat of inoculation and enlargement and induration of the mamma which was beset with miliary caseous tubercles, but no sign of tuberculosis elsewhere.

No tubercle bacilli were found in the milky fluid in the sinuses nor in some of the distended alveoli (milk cysts) ; a few tubercle bacilli were found in a smear made from the miliary tubercles.

Cultures were sown with some of the fluid withdrawn with a pipette from the milk sinuses after death and also with fluid from two milk cysts. All the tubes sown with milk from the sinuses grew numerous colonies of tubercle bacilli in pure culture; numerous colonies were also obtained from one of the milk cysts on the left side; the tubes sown with milk from a cyst on the right side remained sterile. The different strains grew on glycerin media like the culture inoculated.

Experiment I.

Goat 61 was inoculated subcutaneously on July 27, 1908, with 1·0 milligramme of one of the easy growing slightly virulent lupus cultures (H 109. "M.W.").

The milk of the goat was inoculated into guinea-pigs on thirteen separate occasions, at frequent intervals during the first month and at longer ones subsequently, the last series being inoculated 197 days after the inoculation of the goat. Altogether fifty guinea-pigs were inoculated, the majority receiving 10 cubic centimetres each.

Not one of the guinea-pigs developed tuberculosis.

The goat when inoculated was suckling a kid ten weeks old. During the first seventeen days after her inoculation the kid was not allowed to suck, but from the 17th to the 171st days the kid took all the milk with the exception of that which had been withdrawn for the purpose of inoculating guinea-pigs. On the latter date, that is when the feeding experiment had lasted 154 days, the kid was killed; there was no sign of tuberculosis in any of its organs or glands.

The mother goat was killed 197 days after inoculation and showed slight tuberculosis at the seat of inoculation only.

The experiment with this goat was negative probably because on account of the smallness of the dose subcutaneously inoculated there had been little or no dissemination.

Experiment J.

Goat 81 was inoculated intravenously on December 18, 1908, with 2·0 milligrammes of a slightly virulent human tubercle bacillus (H 115. "N.G.").

The milk of the goat was inoculated into five series of guinea-pigs at intervals of twenty-four hours during the first three days after inoculation, then on the 8th and 15th days, four guinea-pigs each receiving 10 cc. being inoculated on each occasion.

All the guinea-pigs in the first two series became tuberculous, while in the third only one developed tuberculosis; in the fourth and fifth series three of the four guinea-pigs became tuberculous, the fourth remaining healthy.

A few days after the last series of guinea-pigs was inoculated, the secretion of milk ceased and the udder became dry. At this time the goat was obviously ill; she gradually became worse and died on January 28, 1909, 41 days after inoculation. The post-mortem examination showed tuberculous pneumonia, enlargement and congestion of the thoracic glands, but no sign of disease elsewhere. Before the *sectio cadaveris* was begun the milk sinuses of each half of the udder were washed out with salt solution; 4·0 cc. of milky fluid was recovered from the right and 5·0 cc. from the left half, and each of these quantities was divided and inoculated into two guinea-pigs; all four guinea-pigs developed general tuberculosis.

In this case therefore tubercle bacilli which had been injected intravenously were demonstrated in the milk secreted during the twenty-four hours following inoculation and on every subsequent occasion up to the 15th day. At the end of the third week the secretion of milk had ceased, but tubercle bacilli were shown to be present in the small quantity of milk which existed in the milk sinuses when the animal died on the 41st day.

Experiment K.

Goat 75 was fed, on a single occasion, September 22, 1908, through a stomach tube with 74·0 milligrammes of culture of a slightly virulent human tubercle bacillus (H 76. "G.M.").

Guinea-pigs were inoculated with her milk at frequent intervals during the first three weeks and at longer ones subsequently, the last series being inoculated 258 days after the goat was fed. Altogether eleven series comprising 42 guinea-pigs were used. None of the guinea-pigs became tuberculous.

Eight months after the experiment began the goat gave birth to two kids which she suckled for nearly two and a-half months; when killed at the end of this period they were found to be perfectly healthy.

The mother goat was killed 328 days after the experiment began and showed calcareous tubercles in some of the neck and mesenteric and ileocolic glands and in one portal gland but no sign of tuberculosis elsewhere.

SUMMARY.

With the object of ascertaining whether tubercle bacilli are excreted in the milk from a normal udder, four cows and seven goats which had not reacted to the tuberculin test were inoculated with culture of such bacilli and their milk tested subsequently on guinea-pigs. Three cows and five goats were inoculated subcutaneously (one of the cows being subsequently inoculated intravenously), one cow and one goat intravenously, and one goat was fed.

The first cow, Cow 300, was inoculated subcutaneously with 100·0 mg. of tubercle bacilli of bovine origin ; the milk withdrawn by hand on the seventh, sixteenth, twenty-first, twenty-eighth, and thirtieth days after the inoculation of the cow produced tuberculosis in guinea-pigs.

The second cow, Cow 77, was inoculated subcutaneously with 100·0 mg. of a culture of human origin which was slightly virulent for the calf and rabbit ; the milk withdrawn by hand twenty-four hours after the inoculation of the cow produced tuberculosis in four of the eight guinea-pigs inoculated, and tuberculosis was produced with two exceptions on every subsequent occasion, including the last, on which the milk was tested ; the last series of guinea-pigs was inoculated after the experiment had lasted 155 days.

The udders of these two cows were normal to the naked eye at the post-mortem examination, and showed no tuberculous lesions or tubercle bacilli on microscopical examination.

The third cow, Cow 61, was also inoculated subcutaneously with 100·0 mg. of a culture of human tubercle bacilli ; the samples of milk were collected by catheterisation ; guinea-pigs were inoculated at intervals of twenty-four hours during the first week and at gradually lengthening intervals subsequently, the last series 84 days after the cow was inoculated. Altogether 76 guinea-pigs were inoculated, and out of these one only developed tuberculosis.

Ninety days after the subcutaneous inoculation this cow was inoculated intra venously with 150·0 mg. of a slightly virulent culture (Virus H 83. "G.C."). During the first fifteen days of the renewed experiment nine series of guinea-pigs were inoculated at intervals of one or two days ; in the first two series (1st and 2nd day's milk) all the guinea-pigs, fourteen in number, developed tuberculosis ; and the milk continued to be infective up to the forty-fourth day when the routine inoculation of guinea-pigs was discontinued on account of the cow's udder becoming 'dry.'

About five and a half months after the intravenous inoculation of the cow some pus was obtained from the two fore quarters, and this on microscopical examination was found to contain very numerous tubercle bacilli ; subsequently tubercle bacilli were demonstrated from the other quarters also.

Two and a half months later it was noticed that three of the quarters had become enlarged and indurated and that a large amount of purulent substance which microscopically contained numerous tubercle bacilli had collected in the sinuses.

The udder decreased in size and the discharge of pus rapidly diminished, a few drops only being obtained at intervals during the remaining period of the experiment. Tubercle bacilli were demonstrated on every occasion.

Cultures were obtained direct from the pus on four different occasions, the last one day before the cow was killed ; these cultures were identical in their cultural characters and in their virulence for the rabbit with the culture intravenously inoculated.

The cow was killed 529 days after the intravenous inoculation, and 619 days after the subcutaneous inoculation ; she showed slight generalised tuberculosis and tuberculosis of the udder.

The faeces of this cow were inoculated into 16 guinea-pigs, six after her subcutaneous inoculation and ten after her intravenous ; 7 died shortly after inoculation, the others survived and when killed one alone was found to be tuberculous ; this guinea-pig had been inoculated 10 days after the intravenous inoculation of the cow.

The fourth cow, Cow 565, was inoculated intravenously with 10·0 milligrammes of a culture of human tubercle bacilli (H 104. "E.R."). Her milk was tested on guinea-pigs eight times during the first fortnight and 11 times during the remaining period of the experiment (168 days). The milk collected 24 hours, 5, 6, 7, and 14 days after inoculation produced tuberculosis in from one to four of the six guinea-pigs inoculated on each occasion; milk collected subsequent to the 14th day did not produce tuberculosis in any of the guinea-pigs inoculated. 153 days after inoculation the cow gave birth to a dead 8 months old calf; the fluid which came away with it was purulent and contained numerous tubercle bacilli; the spleen and a portal gland of the fœtus did not produce tuberculosis in guinea-pigs. The cow was killed after 182 days and showed no tuberculous lesions.

One of the goats, Goat 79, was inoculated subcutaneously with 50·0 milligrammes of a bovine culture from a case of lupus and was killed 9 days later. The milk of the goat was inoculated into guinea-pigs at frequent intervals; that withdrawn from the right half of the udder on the 2nd, 3rd, 4th, and 9th days was infective for guinea-pigs, that from the left side produced tuberculosis in only one of the guinea-pigs inoculated.

Another goat, No. 55, was subcutaneously inoculated with 50·0 mg. of a eugonic culture which was shown subsequently to contain a small proportion of virulent tubercle bacilli. Milk collected at intervals of 24 hours during the first eight days, and on the 14th, 21st, and 75th day, produced tuberculosis in guinea-pigs. At the post-mortem examination of the goat several miliary tubercles were found in the left half of the udder and a caseating patch in the right. Two cultures isolated from the milk of this goat were eugonic and one has been proved to have low virulence for the rabbit.

The third goat, No. 59, was inoculated subcutaneously with 100·0 mg. of a slightly virulent culture. All the guinea-pigs, twenty in number, inoculated with her milk during the first six days became tuberculous. At the post-mortem examination the udder of the goat was normal to the naked eye.

The fourth goat, No. 69, was inoculated subcutaneously with 10·0 mg. of a human tubercle bacillus. Her milk was not infective for the guinea-pigs inoculated during the first week but produced tuberculosis in every guinea-pig inoculated on the 14th day and subsequently. Tuberculosis of her mamma developed on the 42nd day after inoculation. Cultures isolated at various times from her milk resembled the culture inoculated.

The 5th goat, Goat 81, was inoculated intravenously with 2·0 milligrammes of a culture of human tubercle bacilli; she died in 41 days of tuberculosis of the lungs and thoracic glands, no disease being found elsewhere in the body. Milk withdrawn from her on the 1st, 2nd, 3rd, 8th and 15th days, and the fluid recovered from the mammary sinuses on the 41st day after injecting saline solution produced tuberculosis in guinea-pigs.

A sixth goat, Goat 61, was inoculated subcutaneously with 1·0 milligramme, and a seventh (No. 75) was fed with 74·0 milligrammes, of culture, the culture in each case being slightly virulent and easy-growing. The milk of each of these goats was inoculated at intervals into a series of guinea-pigs, 13 series in one case and 11 in the other being used. Not one of the guinea-pigs became tuberculous. These are the only two out of eleven experiments in which the results were entirely negative.

The other nine experiments have shown clearly that the normal mammary gland will permit the escape of tubercle bacilli whether of bovine or of human type from the blood-stream into the milk.

There arises, therefore, strong presumption that the milk of naturally tuberculous cows without udder tuberculosis will contain tubercle bacilli whenever in the course of the disease tubercle bacilli circulate in the blood stream.

A. Stanley Griffith.

TABULAR SUMMARY OF THE EXPERIMENTS.

Reference Letter of Experiment.	Number and Species of Animal.	Dose of Culture.	Method of Inoculation.	Type of Bacillus.	Duration of Life of Animal and Result.	Guinea-pig Inoculations with the Milk.			Remarks.
						Positive Results first obtained.	Results subsequently obtained.		
							Positive.	Negative.	
A.	**Cow 300**	100·0 mg.	Subcutaneous	Bovine (Virus B. VI.)	Died in 30 days (acute tuberculosis).	On the 7th day (1st test).	On the 16th, 21st, 28th, and 30th days.	—	
B.	**Cow 77**	100·0 mg.	Subcutaneous	Human. Group II. (Virus H 68. "R.B.")	Killed after 156 days (local tuberculosis).	On the 1st day	On all subsequent occasions (with two exceptions) from the 2nd to the 155th day.	On the 5th and 28th days.	
C.	**Cow 61**	100·0 mg.	Subcutaneous	Human. Group II. (Virus H 81. "P.W.")	—	On the 7th day (3rd test).	—	On the 14th, 35th, 42nd, 63rd, 67th, and 84th days.	One guinea-pig only out of 76 developed tuberculosis.
	Cow 61 [Reinoculated after 90 days.]	150·0 mg.	Intravenous	Human. Group II. (Virus H 83. "G.C.")	Killed after 529 days (slight generalised T. and T. of mamma).	On the 1st day	On the 2nd, 3rd, 5th, 7th, 8th, 10th, 12th, 15th, and 44th days, and with pus on the 163rd and 528th days.	On the 85th day (one guinea-pig only inoculated, with a small dose).	The udder became dry in the 2nd month after inoculation. Subsequently tuberculous mastitis developed and numerous T.B. were demonstrated microscopically at intervals from the 162nd to the 528th day in pus obtained from the milk sinuses.
D.	**Cow 565**	10·0 mg.	Intravenous	Human. Group II. (Virus H 104. "E.R.")	Killed after 182 days (no tuberculosis).	On the 1st day	On the 5th, 6th, 7th, and 14th days.	On the 2nd, 3rd, 4th, 28th, 42nd, 63rd, 77th, 105th, 133rd, 168th, 175th, 177th, 179th, and 182nd days.	The cow gave birth to a dead calf (8 months) 153 days after her inoculation, and the fluid which came away with it contained numerous T.B.

E.	**Goat 79**	50·0 mg.	Subcutaneous	Human. Group I. (Virus H 110. "J.B." (*a*).)	Killed after 9 days (local T. and T. of lungs).	On the 2nd day (2nd test; right side of udder only).	On the 3rd, 4th, and 9th days (right side), and on the 3rd day (left side).	On the 1st day (both sides) and on the 4th, 5th, 6th, and 9th days (left side only).	The milk secretion had practically ceased on the 9th day.
F.	**Goat 55**	50·0 mg.	Subcutaneous	Human. Groups I and II (mixture). (Virus H 90. "I.P.")	Killed after 103 days (slight generalised T. and T. of mamma).	On the 1st day	On all occasions from the 2nd to the 75th day.	—	
G.	**Goat 59**	100·0 mg.	Subcutaneous	Human. Group II. (Virus H 79. "J.N.")	Killed after 106 days (slight generalised tuberculosis).	On the 1st day	On the 2nd, 4th, 5th, and 6th days.	—	The secretion of milk ceased in the 2nd week after inoculation.
H.	**Goat 69**	10·0 mg.	Subcutaneous	Human. Group II. (Virus H 98. "B.R.")	Killed after 114 days (local T. and miliary T. of mamma).	On the 14th day (6th test).	On the 21st, 28th, and 44th days.	—	The udder became dry during the 2nd month. Cultures were obtained from milky fluid taken from sinuses after death.
I.	**Goat 61**	1·0 mg.	Subcutaneous	Human. Group II. (Virus H 109. "M.W.")	Killed after 197 days (local lesion only).	The milk was tested frequently from the 1st up to the 197th day with negative results.			
J.	**Goat 81**	2·0 mg.	Intravenous	Human. Group II. (Virus H 115. "N.G.")	Died in 41 days (T. of lungs and thoracic glands).	On the 1st day	On the 2nd, 3rd, 8th, 15th, and 41st days.	—	
K.	**Goat 75**	74·0 mg.	Fed	Human. Group II. (Virus H 76. "G.M.")	Killed after 328 days (local tuberculosis only).	The milk was tested frequently from the 1st to the 45th day, and again on the 258th day, with negative results.			Gave birth to two kids 250 days after inoculation. They sucked their mother, and when killed after 72 days were found healthy.

Part II.

THE EXCRETION OF TUBERCLE BACILLI INTO THE UNDEVELOPED UDDER.

INTRODUCTION.

The foregoing experiments demonstrate that when lactating animals are inoculated subcutaneously or intravenously with tubercle bacilli of relatively slight virulence such bacilli appear in their milk within 24 hours of their inoculation and may continue to be eliminated therein for long periods subsequently.

This immediate discharge into and persistence in the milk sinuses of tubercle bacilli which have been introduced into the tissues of an animal renders the vaccination of milch cows with living human tubercle bacilli inadvisable ; cows treated in this way might prove even more dangerous to human health than naturally tuberculous cows since, as the above experiments have shown, the bacilli may exist in the milk sinuses for a long time without altering the quality of the milk or affecting the udder or the general health of the animal.

The vaccination of the bovine animal with living human tubercle bacilli is practised however only on calves and not on animals in use for dairy purposes.

It becomes important therefore to ascertain whether the vaccination of calves intended eventually to supply milk for human consumption is free from the danger which would attend the vaccination of milch cows, whether in fact tubercle bacilli can gain access to the sinuses of the immature mamma, live and multiply therein, and be present in the milk when the animal begins to lactate.

With a view to throwing some light on these questions I have examined the contents of the mammary sinuses of several heifer calves which had been inoculated to test the virulence of various sorts of cultures, and the milk of a goat which was inoculated when pregnant has also been tested.

Observations have been made on eleven heifer calves, all of which had been inoculated subcutaneously with culture. Two of these cultures had the properties of the human tubercle bacillus, one those of the bovine tubercle bacillus, the others resembled bovine tubercle bacilli in their manner of growth, but exhibited lower virulence for the calf and rabbit. All the eleven calves were in good condition when killed and had increased normally in weight ; the disease produced ranged from tuberculosis limited practically to the site of inoculation and the nearest glands to generalised tuberculosis not severe and only apparently progressive in one case.

The material investigated was obtained after the death of the animal in the following way : the skin and teats were thoroughly cleansed and a few cubic centimetres of sterilised salt solution (up to 10·0 cc.) were injected into each of the mammary sinuses, and after massaging the quarter as much of the fluid as possible was withdrawn by means of the pipette used for the injection ; the fluid recovered was usually only slightly milky or turbid, and was always less in amount than that injected.

The following summaries give in the case of each calf the details of the experimental inoculation, an abstract of the post-mortem notes and the results of the investigation of the fluids from the mammary sinuses. I include an account of a case, a heifer (No. 80) inoculated with bovine tubercle bacilli, the details of which have already been reported in the Appendix to the Second Interim Report, Vol. I., pp. 198, 199.

The ages of the calves when killed varied from six to ten months, and the duration of the experiments from 91 to 127 days; the heifer inoculated with bovine tubercle bacilli was 18 months old, and when killed was five months pregnant.

Case 1. A heifer-calf (Calf 1479) inoculated subcutaneously when six months old with 100·0 milligrammes of culture from Virus H 79. "J.N." (Calf 1325, 3rd passage). The cultures of this virus grow luxuriantly on artificial media and have low virulence for the calf and rabbit.

The calf was killed 110 days after inoculation and showed a caseous abscess at the seat of inoculation, slight tuberculosis of the nearest gland, and calcareous tubercles in the suprarenal bodies, the thoracic glands, the mesenteric, ileo-colic and a few other abdominal lymphatic glands.

The mamma was small and free from visible tuberculous lesions; the fluid recovered from the sinuses after injecting saline was small in amount and opalescent. No tubercle bacilli were demonstrated in smear preparations of the fluid, but four guinea-pigs inoculated two with the mixed fluids from the fore quarters and two with the fluids from the hind quarters became tuberculous.

Cultures of the tubercle bacillus were obtained direct from the fluids, numerous colonies developing on tubes sown with a loopful or two; the cultures exhibited the cultural characters of the original cultures of the virus.

Case 2. A heifer-calf (Calf 1601) inoculated subcutaneously when 4 months old with 68·0 milligrammes of culture from the original material of Virus H 143. "L.L."

The calf was killed 91 days after inoculation and showed a caseous abscess at the seat of inoculation, tuberculosis of the nearest glands, a few minute tubercles in the lungs, some caseous foci in the ileo-colic glands and about fifteen miliary caseous tubercles in the suprarenal bodies.

The mamma was free from macroscopic tuberculous lesions. Slightly turbid fluid was recovered from each of the sinuses after injecting saline solution. One or two tubercle bacilli were seen in smear preparations of fluid from each of three of the quarters, none in that from the fourth; the fluid from each of the four quarters produced numerous colonies on culture tubes, and tuberculosis in guinea-pigs.

Case 3. A heifer-calf (Calf 1461) inoculated subcutaneously when six months old with 50·0 milligrammes of culture from Virus H 53. "D.H." (*a*) (Calf 1367, 3rd passage).

The calf was killed 111 days after inoculation and showed a caseous local lesion, tuberculosis of the nearest glands, a few scattered calcareous foci in the thoracic glands, and three softened caseous tubercles in a mammary lymphatic gland.

The mamma was well-developed and no tuberculous lesions were found in it. There was a small quantity of opalescent fluid in each of the sinuses which in one case showed microscopically moderately numerous tubercle bacilli. A culture of tubercle bacilli was obtained direct from the fluid, and one guinea-pig inoculated with a few drops developed tuberculosis.

Case 4. A heifer-calf (Calf 1535) inoculated subcutaneously when about three months old with 50·0 milligrammes of culture from the original material of Virus H 53. "D.H." (*b*).

The calf was killed when in good health 103 days after inoculation and showed a local abscess, tuberculosis of the adjacent gland, scattered calcareous tubercles in the lungs and the spleen, tuberculous foci and ulcers in the intestines and caseous or calcareous tubercles in nearly every lymphatic gland.

No tubercles were found in the tissue of the mammary gland. In the sinuses and ducts of the right fore quarter there was a small quantity of purulent fluid which microscopically showed tubercle bacilli: from the other quarters slightly milky fluid was obtained after injecting saline; no tubercle bacilli were found in smear preparations of this fluid.

A guinea-pig inoculated with the pus from the right fore quarter died of severe general tuberculosis; those inoculated with the milky fluid recovered from the left fore and right hind quarters remained healthy.

A pure culture of the tubercle bacillus was obtained from the pus; tubes sown with the milky fluids remained sterile. The culture grew on the differential media like the culture inoculated into the calf.

Case 5. A heifer-calf (Calf 1571) inoculated subcutaneously when 3½ months old with 50·0 milligrammes of culture from Virus H 53. "D.H." (*b*) (Calf 1561, 1st passage).

The calf was killed 111 days after inoculation and showed a small caseous abscess at the seat of inoculation, tuberculosis of the nearest glands, three tubercles in the spleen, a caseous nodule in a suprarenal body and one or more minute foci in each of seven lymphatic glands.

The mamma was normal to the naked eye; the sinuses were washed out with saline and a small quantity of very slightly turbid fluid recovered from each. Microscopical examinations and guinea-pig inoculations of these fluids gave negative results, and culture tubes sown with them remained sterile.

Case 6. A heifer-calf (Calf 1505) inoculated subcutaneously when five months old with 100·0 milligrammes of culture from Virus H 107. "H.H." (Calf 1453).

The calf was in good health when killed 101 days after inoculation. The post-mortem examination showed a small local lesion, caseo-calcareous changes in the nearest glands and some ulcerated tuberculous nodules in the intestines; there was no sign of tuberculosis elsewhere, and the mamma was normal to the naked eye.

The mammary sinuses were washed out with saline, and the slightly turbid fluid recovered was used to sow cultures and inoculate guinea-pigs. The results were negative. No tubercle bacilli were found in smear preparations of the fluid.

Case 7. A heifer-calf (Calf 1549) inoculated subcutaneously when 2½ months old with 50·0 milligrammes of culture from Virus H 107. "H.H." (Calf 1497).

The calf was killed in good health 97 days after inoculation, and was found to have slight general tuberculosis, apparently progressive in the thoracic glands. The mamma was well-developed, and was free from macroscopic tuberculosis; many of the lactiferous ducts contained plugs of purulent substance.

The mammary sinuses were washed out with saline, the recovered fluids depositing pus in the form of casts. Tubercle bacilli were found in smear preparations, and numerous colonies grew on culture media sown from the mixed fluids from the fore quarters and the mixed fluids from the hind quarters. No guinea-pigs were inoculated.

Case 8. A heifer-calf (Calf 1577) inoculated subcutaneously when 3½ months old with 50·0 milligrammes of culture from Virus H 107. "H.H." (Calf 1551, 2nd Passage).

The calf was killed 103 days after inoculation and showed a caseo-purulent abscess at the seat of inoculation, caseation of the adjacent glands, one tubercle in each suprarenal body and one or more minute foci in the thoracic and three abdominal glands.

The mamma was normal to the naked-eye ; the sinuses were washed out with saline ; the fluid recovered was in each case very slightly turbid. Microscopical examinations and guinea-pig inoculations of these fluids gave negative results, and culture tubes sown with them remained sterile.

Case 9. A heifer-calf (Calf 1583) inoculated subcutaneously when 11 weeks old with 50·0 milligrammes of culture from Virus H 107. " H.H." (Calf 1549, 1st Passage.)

The calf was killed 127 days after inoculation and showed a small abscess at the seat of inoculation, caseous and calcareous nodules in the adjacent prescapular gland, a minute focus in one suprarenal body, and one or more foci, mostly minute, in the thoracic and two or three abdominal glands.

The udder was small and showed very little glandular tissue ; the sinuses were washed out with saline. Microscopical examination of the fluids recovered from the sinuses showed no tubercle bacilli, guinea-pigs inoculated with the fluids remained healthy, and culture tubes sown with them sterile.

Case 10. A heifer-calf (Calf 1533) inoculated subcutaneously when four months old with 50·0 milligrammes of culture from Virus H 108. " H.R." (Calf 1417).

The calf was killed in good health 98 days after the inoculation and was found to have widespread generalised tuberculosis ; all the lymphatic glands were affected some rather severely, but in the chief organs the lesions were not very numerous, and all had retrogressive characters.

The mamma was free from macroscopic tuberculous lesions. A small quantity of slightly turbid fluid was recovered from each of the sinuses after injecting saline. The mixed fluids from the two fore quarters and the mixed fluids from the two hind quarters were each used to inoculate a guinea-pig and to sow cultures.

The guinea-pig inoculated with the fluid from the fore quarters became tuberculous, the other remained healthy.

Two egg tubes sown with the fluid from the fore quarters produced altogether eight colonies of tubercle bacilli ; those sown from the hind quarters remained sterile.

Case 11. A heifer (Heifer 80) inoculated subcutaneously when about 18 months old with an emulsion made from a bovine tuberculous gland (Virus B. V) the dose containing 4½ million tubercle bacilli. The full details of this case are given in the Appendix to the 2nd Interim Report, Vol. I., p. 198.

The heifer was killed 62 days after inoculation and showed slight generalised tuberculosis ; there was a five months old foetus in the uterus which was not tuberculous ; the mammary tissues showed no naked-eye evidence of tuberculosis and the milk sinuses contained a small quantity of thick yellowish fluid ; no tubercle bacilli were demonstrated in a smear preparation made from the fluid, but a guinea-pig inoculated with it died of general tuberculosis.

Case 12. A heifer-calf (Calf 1569) inoculated subcutaneously when 3 months old with 50·0 milligrammes of culture from the original material of Virus H 127. " R.R." (*a*).

The calf was killed when in good health 105 days after inoculation and showed slight general tuberculosis apparently retrogressive.

The mamma appeared normal (the supramammary lymphatic glands were normal). Thin grey purulent fluid was expressed from the teats of three of the quarters ; these fluids showed tubercle bacilli on microscopical examination, and produced numerous colonies on culture tubes sown with them. From the remaining quarter (L.H.) no pus could be expressed ; the sinus was washed out with salt solution ; microscopical examination of the recovered fluid showed no tubercle bacilli and culture tubes sown with it remained sterile.

Case 13. Goat 77, a young pregnant primipara, was inoculated subcutaneously with 25·0 milligrammes of a human Group II culture obtained from sputum (Virus H 118. " F.C.").

This experiment was made for the purpose of ascertaining whether tubercle bacilli can pass from the blood into the milk sinuses of an immature mamma and remain alive therein until the animal begins to lactate. The experiment had a negative result.

The goat gave birth to two dead full-time foetuses 52 days after inoculation. The udder was well-developed and yielded a good supply of milk. Guinea-pigs were inoculated with milk withdrawn 8 hours, 1, 2, 8, 14, 28, and 59 days after the birth of the kids, and all remained free from tuberculosis. Microscopical examinations and culture experiments were also negative.

SUMMARY.

In seven out of eleven heifers tubercle bacilli of various types which had been inoculated in large dose into the subcutaneous tissues had found their way into the milk sinuses of the undeveloped mamma, and in four cases at least (Calves 1461, 1535, 1569, and 1601) were present in such numbers as to suggest that since their arrival there they had undergone multiplication.

These observations clearly establish the important fact that tubercle bacilli which have been introduced into the subcutaneous tissues of a calf can find their way into the ducts and milk sinuses of the immature mamma, and suggest that they may live and multiply therein for considerable periods.

Whether the bacilli in these cases would have remained alive until the period of lactation is a matter of conjecture, but judging from the length of time bacilli have been shown to be capable of living in the milk sinuses of cows there is reasonable probability that the first milk of some of these animals would have contained living tubercle bacilli.

Though there is not complete evidence that bacilli excreted into the milk sinuses of the immature udder do remain alive therein until the period of lactation begins, the facts established point strongly to the desirability of testing, before permitting its use as human food, the milk of all cows which have been vaccinated as calves with living human tubercle bacilli.

TABULAR SUMMARY OF THE EXPERIMENTS WITH MATERIAL OBTAINED FROM THE MAMMARY SINUSES OF TWELVE HEIFERS AND ONE GOAT SUBCUTANEOUSLY INOCULATED WITH CULTURES OF TUBERCLE BACILLI OF HUMAN (AND ONE OF BOVINE) ORIGIN.

Number of Case.	Number of Animal and Age at Inoculation.	Dose in Milli-grammes.	Type of Bacillus Inoculated.	Duration of Life of Animal.	Extent of Disease.	Results of Examination of Material from Mammary Sinuses.			
						Source of Material.	Microscopical Examination.	Guinea-pig Inoculations.	Cultures.
1	Heifer 1479 (6 months).	100·0 mg.	Human. Group II. (Virus H 79. "J.N.")	Killed after 110 days.	Slight generalised retrogressive T. (mamma normal).	Two fore quarters	No T. B.	Positive	Moderately numerous colonies.
						Two hind quarters	No T. B.	Positive	Moderately numerous colonies.
2	Heifer 1601 (4 months).	68·0 mg.	Human. Group II. (Virus H 143. "L.L.")	Killed after 91 days.	Local T. with a few disseminated lesions (mamma normal).	Right fore quarter	A few T. B.	Positive	Numerous colonies.
						Left fore quarter	A few T. B.	Positive	Numerous colonies.
						Right hind quarter	A few T. B.	Positive	Numerous colonies.
						Left hind quarter	No. T. B.	Positive	Numerous colonies.
3	Heifer 1461 (6 months).	50·0 mg.	Attenuated bovine (H 53. "D.H." (*a*))	Killed after 111 days.	Local T. with a few disseminated lesions (mamma normal).	One of the quarters	A moderate number of T. B.	Positive	Moderately numerous colonies.
4	Heifer 1535 (3 months).	50·0 mg.	Attenuated bovine (H 53. "D.H." (*b*))	Killed after 103 days.	Slight generalised T. (mamma normal).	Right fore quarter	A few T. B.	Positive	Numerous colonies.
						Left fore quarter	—	Negative	Tubes remained sterile.
						Right hind quarter	No T. B.	Negative	Tubes remained sterile.
						Left hind quarter	No T. B.	—	Tubes remained sterile.
5	Heifer 1571 ($3\frac{1}{2}$ months).	50·0 mg.	Attenuated bovine (H 53. "D.H." (*b*)	Killed after 111 days.	Local T. with a few disseminated lesions (mamma normal).	Right fore quarter Left fore quarter Right hind quarter Left hind quarter	No. T. B.	Negative	Tubes remained sterile
6	Heifer 1505 (5 months).	100·0 mg.	Attenuated bovine (H 107. "H.H.")	Killed after 101 days.	Local T. with a few disseminated lesions (mamma normal).	Two fore quarters	No T. B.	Negative	Tubes remained sterile.
						Two hind quarters	No T. B.	Negative	Tubes remained sterile.
7	Heifer 1549 (10 weeks).	50·0 mg.	Attenuated bovine (H 107. "H.H.")	Killed after 97 days.	Slight G. T. apparently progressive in thoracic glands (mamma normal).	Two fore quarters	A few T. B.	—	Moderately numerous colonies.
						Two hind quarters	A few T. B.	—	Moderately numerous colonies.
8	Heifer 1577 ($3\frac{1}{2}$ months).	50·0 mg.	Attenuated bovine (H 107. "H.H.")	Killed after 103 days.	Local T. with a few disseminated lesions (mamma normal).	Right fore quarter Left fore quarter Right hind quarter Left hind quarter	No. T. B.	Negative	Tubes remained sterile.

TABULAR SUMMARY OF THE EXPERIMENTS WITH MATERIAL OBTAINED FROM THE MAMMARY SINUSES OF TWELVE HEIFERS AND ONE GOAT SUBCUTANEOUSLY INOCULATED WITH CULTURES OF TUBERCLE BACILLI OF HUMAN (AND ONE OF BOVINE) ORIGIN.

Number of Case.	Number of Animal and Age at inoculation.	Dose in Milligrammes.	Type of Bacillus Inoculated.	Duration of Life of Animal.	Extent of Disease.	Results of Examination of Material from Mammary Sinuses.			
						Source of Material.	Microscopical Examination.	Guinea-pig Inoculations.	Cultures.
9	Heifer 1583 (2½ months).	50·0 mg.	Attenuated bovine (H 107. "H.H.")	Killed after 127 days.	Local T. with a few disseminated lesions (mamma normal).	Right fore quarter Left fore quarter Right hind quarter Left hind quarter	No. T. B.	Negative	Tubes remained sterile.
10	Heifer 1533 (4 months).	50·0 mg.	Attenuated bovine (H 108. "H.R."	Killed after 98 days.	Slight retrogressive generalised T. (mamma normal).	Two fore quarters Two hind quarters	No T. B. No T. B.	Positive Negative	Eight colonies on two tubes. Tubes remained sterile.
11	Heifer 80 (18 months).	Tissue emulsion; estimated dose 4,500,000 T. B.	Bovine (Virus B V).	Killed after 62 days.	Slight general progressive T. (mamma normal).	One of the quarters	No T. B.	Positive	—
12	Heifer 1569 (3 months).	50·0 mg.	Bovine. (Virus H 127. "R.R." (*a*)	Killed after 105 days.	Slight G. T. apparently retrogressive (mamma normal).	Right fore quarter Left fore quarter Right hind quarter Left hind quarter	A few T. B. A few T. B. A few T. B. No. T. B.	— — — —	Numerous colonies. Numerous colonies. Numerous colonies. Tubes remained sterile.
13	Goat 77 (Young adult).	25·0 mg.	Human. Group II. (H 118. "F.C.")	Killed after 116 days.	Local T. and slight T. of lungs (mamma normal).	The goat gave birth to two dead kids 52 days after her inoculation. Her milk was tested on guinea-pigs 8 hours after parturition, and on several occasions subsequently, with negative results. Culture tubes sown with the milk 8 hours after parturition remained sterile.			

DETAILS OF THE EXPERIMENTS DEALT WITH IN PART I. OF THE REPORT.

EXPERIMENT A.

COW 300.

Subcutaneous inoculation of culture derived from a tuberculous mediastinal gland of a cow (Virus B VI.).

Date—September 2, 1905.

Dose—100·0 milligrammes.

Died—October 2, 1905. [30 days after inoculation.]

Clinical History.

The cow was inoculated subcutaneously on the left side of the neck on September 2, 1905.

Four days after inoculation there was a slightly raised tender local swelling, 3 in. in diameter; the prescapular gland was appreciably enlarged. On September 13, 1905, 11 days after inoculation the tumour was more raised, and measured 5 in. by 4 in. in superficial area. Subsequently the tumour became more prominent, but increased in area only to a slight extent.

The prescapular gland enlarged considerably and measured at the end of three weeks 6 in. in long diameter; the spherical prepectoral gland was the size of a bagatelle ball.

Constitutional symptoms were first noticed about the 16th day; the coat was staring and there was some loss of appetite. From this date the progress of the disease was rapid. The respiration became greatly increased and finally laboured, and there was frequent cough and rapid emaciation, the average loss in weight per day being 5·4 lbs.

The cow died suddenly on October 2, 1905, 30 days after inoculation.

Temperature.

The temperature rose gradually from 38·5° C. on the 4th day to 40·7° C. on the 12th; it then maintained a high level, maximum 40·9°., falling on the morning of the day of death to 38·9.

Weights.

There was a steady loss in weight.

	cwt.	qrs.	lbs.
September 5, 1905	5	1	15
September 12, 1905	5	0	21
September 19, 1905	4	3	25
September 26, 1905	4	1	17
October 2, 1905...	4	0	9

Loss in weight.—1 cwt. 1 qr. 6 lbs.

Average loss per day.—5·4 lbs.

POST-MORTEM EXAMINATION.

Condition poor.

Local Lesion.—The local lesion weighed 14 ozs. and measured 14 by 7 by 4 cm.; it was composed of caseo-necrotic substance adherent to the skin and muscles.

Left Prescapular Gland.—The left prescapular gland was enlarged (12·5 by 6·8 by 5·5 cm.), and the cortex was caseating throughout.

The Left Prepectoral Gland, the size of a pigeon's egg, was dense and caseous throughout.

The Right Prescapular Gland contained several minute opaque tubercles.

The Cervical Glands on either side contained a few opaque tubercles, varying in size up to a pin's head.

Abdomen.

Diaphragm.—On the peritoneal surface of the diaphragm there were some flattened translucent tubercles with opaque centres.

Spleen.—The spleen weighed 1½ lbs.; the pulp was almost diffluent and contained a moderate number of scattered miliary tubercles.

Liver.—The substance was soft and only a single grey tubercle was seen.

Portal Glands.—In the portal glands no tubercles were visible; they were extremely soft and slightly decomposed.

Gall Bladder.—Normal.

Kidneys.—The left kidney contained five grey tubercles up to a pinhead in size.

The right kidney contained one opaque slightly yellow tubercle.

Suprarenals.—The suprarenal bodies were normal.

Renal Glands.—These contained a few miliary tubercles with opaque centres.

Thorax.

Heart.—Normal.

Pericardium.—The pericardial sac contained a small amount of blood-stained fluid.

Pleura.—On the parietal pleura there were four flattened loosely attached translucent tubercles opaque in the centre, up to 1·5 millimetre in diameter.

Lungs.—The lungs were very emphysematous; large blebs of gas could be seen beneath the pleura extending into and distending the interlobular connective tissue.

The right anterior and middle lobes were red and consolidated. The left anterior lobe was congested, but floated in water. The substance of all the lobes was closely filled with grey miliary tubercles with opaque yellowish centres.

There was considerable emphysema of the tissues in the dorsal mediastinum.

Bronchial Glands, Infra-tracheal Glands.—No tubercles were seen.

Mediastinal Glands.—The dorsal mediastinal glands were extremely soft and discoloured and contained gas. In some of them four or five yellowish miliary tubercles could be seen; in the others no tubercles were visible.

Alimentary Tract.

Pharynx, Larynx.—Normal.

Parotid Glands.—In the left parotid salivary gland there were four opaque pinhead tubercles, and three similar tubercles in the lymphatic gland.

The right parotid salivary and lymphatic glands appeared normal.

The Posterior Pharyngeal Glands were congested and contained numerous minute opaque foci.

Intestines.—Normal.

The Mesenteric Glands were soft and œdematous and a few minute opaque tubercles could be seen in each.

Mamma.—Normal in appearance.

Various Lymphatic Glands.

The Gluteal, Ischiatic, Popliteal, Axillary, Submaxillary, Lumbar, Iliac, Precrural, Supramammary, Sacro-Iliac, and Cœliac glands contained each a few opaque yellowish tubercles, varying in size up to that of a pin's head.

Microscopical Examination.

Liver (grey tubercle).—A few tubercle bacilli.

Udder.—No tubercle bacilli.

Mesenteric Gland	Moderate numbers of tubercle bacilli.
Ischiatic Gland	
Thoracic Gland	

Right Bronchial Gland.—Numerous tubercle bacilli.

LIST OF GUINEA-PIGS INOCULATED WITH MILK OF COW 300.

DOSE OF MILK IN EACH CASE: 5 cc. (NOT CENTRIFUGALISED).

Date.	Number of Guinea-pig and Quarter of udder.	Duration of Life in Days.		Killed or Died.	Result.
		Intraperitoneal.	Subcutaneous.		
September 1st, 1905 [Before inoculation of Cow].	1660 R.F.		39	K	Healthy.
	1661	36		D	No tuberculosis.
	1662 L.H.		39	K	Healthy.
	1663	39		K	Healthy.
	1664 L.F.		39	K	Healthy.
	1665	39		K	Healthy.
	1666 R.H.		39	K	Healthy.
	1667	39		K	Healthy.
September 9, 1905 [7 days after inoculation].	1681 R.F.		41	K	Small local lesion: tuberculosis of inguinal and portal glands (numerous T.B. in both).
	1682	25		D	No tuberculosis.
	1683 L.H.		41	K	No tuberculosis.
	1684	5		D	No tuberculosis.
	1685 L.F.		31	D	No tuberculosis.
	1686	41		K	Tuberculosis of omentum, spleen, liver, and many lymphatic glands: T.B. found in a lumbar gland.
	1687 R.H.		31	D	No tuberculosis.
	1688	41		K	Small local lesion: minute point in left inguinal gland: sternal gland caseous (T.B.).
September 18, 1905 [16 days after inoculation].	1693 R.F.		7	D	A few T.B. were found in the local lesion: inguinal glands normal.
	1694	19		D	No tuberculosis.
	1695 L.H.		42	K	No tuberculosis.
	1696	7		D	No tuberculosis.
	1697 L.F.		42	K	No tuberculosis.
	1698	42		K	Tuberculosis of omentum, spleen, and liver; many lymphatic glands extensively caseous: T.B. in spleen, omental and portal glands.
	1699 R.H.		42	K	Local lesion: right inguinal and portal glands were caseous: T.B. in portal gland.
	1700	19		D	No tuberculosis.
September 23, 1905 [21 days after inoculation].	1709 R.F.		38	D	Local ulcer: inguinal, portal, and coeliac glands caseous (T.B.): 3 tubercles in spleen (T.B.).
	1710	40		D	General tuberculosis.
	1711 L.H.		77	D	General tuberculosis: lungs slightly affected.
	1712	73		D	General tuberculosis.
	1713 L.F.		70	D	General tuberculosis: lungs only slightly affected.
	1714	14		D	No tuberculosis.
	1715 R.H.		42	D	Small local lesion: caseation of right deep inguinal and iliac glands (T.B. in both).
	1716	79		K	No tuberculosis.
September 30, 1905 [28 days after inoculation].	1719 R.F.		62	D	General tuberculosis.
	1720	32		D	General tuberculosis.
	1721 L.H.		60	D	General tuberculosis.
	1722	33		D	Slight tuberculosis.
	1723 L.F.		61	D	General tuberculosis: two tubercles in lungs.
	1724	66		D	General tuberculosis.
	1725 R.H.		32	D	Carcass partly eaten: sternal and right axillary glands were caseous: T.B. in former.
	1726	32		D	General tuberculosis.
October 2, 1905 [30 days after inoculation].	1727 R.F.		39	D	Slight tuberculosis.
	1728	26		D	Carcass eaten.
	1729 L.H.		59	D	General tuberculosis: not severe.
	1730	43		D	General tuberculosis.
	1731 L.F.		57	D	General tuberculosis.
	1732	39		D	General tuberculosis.
	1733 R.H.		29	D	Carcass eaten.
	1734	42		D	General tuberculosis.

EXPERIMENT B.

COW 77.

Subcutaneous inoculation of culture derived from a bone abscess (Virus H 68. "R.B.").

Dose—100·0 milligrammes.

Date of Inoculation—November 28, 1906.

Weight—7 cwt. 3 qrs 24 lbs.

Killed when in good health—May 3, 1907. [156 days after inoculation.]

Clinical Notes.

Twenty-four hours after inoculation blood from the cow was injected intraperitoneally into a guinea-pig in a dose of 1 cc. The animal showed no sign of tuberculosis when killed 46 days later.

Nine days after inoculation on the left side of the neck there was a slightly raised somewhat flattened tender swelling about 6 cm. in diameter. The left prescapular gland was slightly enlarged, but measurement was not possible on account of fat. The cow was quite well.

Three months later the tumour at the seat of inoculation was represented by a small circular thickening 5 cm. in diameter, with a small dry scab in the centre. The prescapular gland was then apparently normal in size.

The cow remained well during the whole period of the experiment.

Temperature.

The temperature was irregular during the first three weeks, reaching a maximum of 40·0° C. on the sixth day. It was subsequently normal.

Tuberculin Test.

January 31, 1907. [64 days after inoculation.] Reacted. Rise of temperature 1·9° C.

Weights.

The cow was an old animal, and the weight remained stationary during the experiment.

	cwt.	qrs.	lbs.
Nov. 28, 1906	7	3	24
May 3, 1907	7	3	20

POST-MORTEM EXAMINATION.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a thickened patch of skin measuring about 5 cm. in area and 1 cm. in thickness ; on transverse section this showed in the centre a small pyramidal mass, with the apex near the surface, of pinkish fibroid tissue containing a soft caseo-purulent focus ; there was no sign of tuberculosis in the subcutaneous tissues or in the muscles under the thickened patch.

Left Prescapular Gland.—The left prescapular gland measured 5·5 by 3 by 1·5 cm. and showed at one extremity a yellow caseo-purulent nodule about 1 cm. in diameter, containing gritty foci ; the rest of the gland was normal.

Right Prescapular Gland.—The gland measured 5 by 3 by 1·5 cm. and was normal on section.

Prepectoral and Axillary Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—The lungs were crepitant throughout and showed no areas of collapse ; under the pleura of the right caudal lobe a spherical grey (?) tubercle (1·5 mm.) with a soft whitish centre was seen ; otherwise the lungs were perfectly healthy.

Bronchial and Mediastinal Glands.—Normal.

Heart.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—Normal.

Liver.—The liver showed sparsely scattered throughout its substance small irregular yellow, sometimes greenish yellow, foci.

Portal Glands.—Normal.

Kidneys and Suprarenal Bodies.—Normal.

Renal and Lumbar Glands.—Normal.

The skin on the right side of the abdomen showed a hæmorrhagic abraded area, about 5 cm. in diameter (site of an injury) ; the subcutaneous tissues under and around this were oedematous.

Iliac and Precrural Glands.—The iliac and precrural glands on the right side were much enlarged ; their substance was friable and infiltrated with yellow points and a fine yellow network (? inflammatory).

The glands on the left side were normal.

Supramammary Glands.—The supramammary glands showed in the cortices sparsely scattered yellow points and here and there a yellow network. (The condition was similar to that seen in the iliac and precrural glands but not so advanced.)

Genito-Urinary System.

Uterus.—Normal.

Udder.—The udder with attached skin and glands weighed 13 lbs. ; on section the quarters were abnormally tough and showed a marked increase in interstitial connective tissue. The walls of some of the ducts in the right forequarter, which during life was felt to be knotty and indurated, were much increased in thickness, the milk sinuses and ducts containing thick creamy purulent fluid. The left fore-quarter was smaller than the right fore ; the walls of some of the ducts appeared thickened ; in the anterior part after a longitudinal section a peasized tense grey nodule was seen projecting from the surface ; on section this appeared to be a localised dilatation of one of the ducts, with grey fibrous walls and creamy contents (a smear from the contents after long search revealed two tubercle bacilli).

There was no obvious macroscopic evidence of tuberculosis in any of the quarters.

Alimentary Tract.

Tongue, Pharynx, Palate, and Tonsils.—Normal.

Submaxillary, Retropharyngeal, Hyoid, and Parotideal Glands.—Normal.

Intestines.—Normal.

Mesenteric, Ileo-colic, and Colic Glands.—Normal.

Various Lymphatic Glands.

Popliteal, Gluteal, and Ischiatic Glands.—Normal.

Microscopical Examination.

Contents of Grey Nodule from L.F. Quarter of Udder—Two tubercle bacilli seen.

Scraping from Supramammary Gland.—No tubercle bacilli.

Foci from Liver.—No tubercle bacilli.

Lung (? tubercle from).—No tubercle bacilli.

Animals Inoculated.

The following guinea-pigs were inoculated intraperitoneally :—

Emulsion of Spleen.—G.P. 2421.

Emulsion of Liver.—G.P. 2422.

Emulsion of Supramammary Gland.—G.P. 2423.

Emulsion of Left Prescapular Gland.—G.P. 2424.

The first three animals were killed after 91 days and found to be healthy ; the latter showed general tuberculosis when killed after 92 days.

GUINEA-PIGS INOCULATED WITH THE MILK OF COW 77.

Date.	Total yield of milk in 24 hours.	No. of Guinea-pig.	Mode of Injection.	Quarter of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
Nov. 28, 1906 [Before inoculation].		2021	Intrap.	L.F.	5 cc.	K.	36 days	Healthy.
		2022	,,	L.H.	,,	,,	,,	Healthy.
		2023	,,	R.F.	,,	,,	,,	Healthy.
		2024	,,	R.H.	,,	,,	,,	Healthy,
Nov. 29, 1906 [24 hours after inoculation].	2350 cc.	2027	Intrap.	L.F.	5 cc.	K.	46 days	No tuberculosis.
		2028	Subcut.	,,	,,	D.	17 days	Carcass eaten by other guinea-pigs.
		2031	Intrap.	L.H.	,,	K.	46 days	No tuberculosis.
		2032	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2025	Intrap.	R.F.	,,	,,	,,	(?) tuberculosis of omentum.
		2026	Subcut.	,,	,,	,,	,,	Slight tuberculosis.
		2029	Intrap.	R.H.	,,	,,	,,	Slight tuberculosis.
		2030	Subcut.	,,	,,	,,	,,	Slight tuberculosis.
Nov. 30, 1906 [2 days after inoculation].	1450 cc.	2049	Intrap.	L.F.	5 cc.	K.	45 days	Slight general tuberculosis.
		2050	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2051	Intrap.	L.H.	,,	,,	,,	Slight tuberculosis.
		2052	Subcut.	,,	,,	,,	,,	Slight general tuberculosis.
		2047	Intrap.	R.F.	,,	,,	,,	Slight tuberculosis.
		2048	Subcut.	,,	,,	,,	,,	Slight tuberculosis.
		2045	Intrap.	R.H.	,,	,,	,,	Slight tuberculosis.
		2046	,,	,,	,,	,,	,,	General tuberculosis.
Dec. 1, 1906 [3 days after inoculation].	1600 cc.	2057	Intrap.	L.F.	5 cc.	K.	46 days	Slight general tuberculosis.
		2058	Subcut.	,,	,,	,,	,,	Slight tuberculosis.
		2059	Intrap.	L.H.	,,	,,	,,	Slight general tuberculosis.
		2060	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2053	Intrap.	R.F.	,,	,,	,,	Slight tuberculosis.
		2054	Subcut.	,,	,,	,,	,,	Slight tuberculosis.
		2055	Intrap.	R.H.	,,	,,	,,	Slight tuberculosis.
		2056	Subcut.	,,	,,	,,	,,	Slight tuberculosis.
Dec. 2, 1906 [4 days after inoculation].	2150 cc.	2065	Intrap.	L.F.	5 cc.	K.	46 days	Very slight tuberculosis.
		2066	Subcut.	,,	,,	,,	,,	Slight general tuberculosis.
		2067	Intrap.	L.H.	,,	,,	,,	Slight tuberculosis.
		2068	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2069	Intrap.	R.F.	,,	,,	,,	One (?) tubercle in omentum.
		2070	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2071	Intrap.	R.H.	,,	,,	,,	Slight general tuberculosis.
		2072	Subcut.	,,	,,	,,	,,	No tuberculosis.

GUINEA-PIGS INOCULATED WITH THE MILK OF COW 77—*continued.*

Date.	Total yield of milk in 24 hours.	No. of Guinea-pig.	Mode of Injection.	Quarter of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
Dec. 3, 1906 [5 days after inoculation].	1900 cc.	2073	Intrap.	L.F.	5 cc.	K.	53 days	No tuberculosis.
		2074	Subcut.	,,	,,	,,	,,	(?) Slight tuberculosis of inguinal and left iliac glands.
		2075	Intrap.	L.H.	,,	,,	,,	No tuberculosis.
		2076	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2077	Intrap.	R.F.	,,	,,	,,	No tuberculosis.
		2078	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2079	Intrap.	R.H.	,,	,,	,,	No tuberculosis.
		2080	Subcut.	,,	,,	,,	,,	No tuberculosis.
Dec. 4, 1906 [6 days after inoculation].	1850 cc.	2081	Intrap.	L.F.	5 cc.	K.	56 days	General tuberculosis.
		2082	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2083	Intrap.	L.H.	,,	,,	,,	No tuberculosis.
		2084	Subcut.	,,	,,	,,	,,	General tuberculosis.
		2085	Intrap.	R.F.	,,	,,	,,	General tuberculosis.
		2086	Subcut.	,,	,,	D.	13 days	Local lesion only. (?) cause of death.
		2087	Intrap.	R.H.	,,	K.	56 days	General tuberculosis.
		2088	Subcut.	,,	,,	,,	,,	No tuberculosis.
Dec. 5, 1906 [7 days after inoculation].	1800 cc.	2089	Intrap.	L.F.	5 cc.	K.	57 days	Slight general tuberculosis.
		2090	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2091	Intrap.	L.H.	,,	D.	9 days	Pseudo-tuberculosis.
		2092	Subcut.	,,	,,	K.	57 days	No tuberculosis.
		2093	Intrap.	R.F.	,,	,,	,,	Slight general tuberculosis.
		2094	Subcut.	,,	,,	,,	,,	Slight general tuberculosis.
		2095	Intrap.	R.H.	,,	,,	,,	General tuberculosis, moderately severe.
		2096	Subcut.	,,	,,	,,	,,	Slight general tuberculosis.
Dec. 12, 1906 [14 days after inoculation].	—	2109	Intrap.	L.F.	5 cc.	K.	55 days	General tuberculosis.
		2110	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2111	Intrap.	L.H.	,,	D.	1 day	No sign of disease. (?) cause of death.
		2112	Subcut.	,,	,,	K.	55 days	No tuberculosis.
		2113	Intrap.	R.F.	,,	,,	,,	General tuberculosis.
		2114	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2115	Intrap.	R.H.	,,	,,	,,	General tuberculosis.
		2116	Subcut.	,,	,,	,,	,,	No tuberculosis.
Dec. 19, 1906 [21 days after inoculation].	2600 cc.	2128	Intrap.	L.F.	5 cc.	D.	16 days	Pseudo-tuberculosis.
		2129	Subcut.	,,	,,	K.	54 days	No tuberculosis.
		2130	Intrap.	L.H.	,,	,,	,,	No tuberculosis.
		2131	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2132	Intrap.	R.F.	,,	,,	,,	No tuberculosis.
		2133	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2134	Intrap.	R.H.	,,	,,	,,	Slight tuberculosis.
		2135	Subcut.	,,	,,	,,	,,	No tuberculosis.

GUINEA-PIGS INOCULATED WITH THE MILK OF COW 77—*continued.*

Date.	Total yield of milk in 24 hours.	No. of Guinea-pig.	Mode of Injection.	Quarter of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
Dec. 26, 1906 [28 days after inoculation].	—	2141	Intrap.	L.F.	5 cc.	K.	58 days	No tuberculosis.
		2142	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2143	Intrap.	L.H.	,,	,,	,,	No tuberculosis.
		2144	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2145	Intrap.	R.F.	,,	,,	,,	No tuberculosis.
		2146	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2147	Intrap.	R.H.	,,	,,	,,	No tuberculosis.
		2148	Subcut.	,,	,,	,,	,,	General tuberculosis (spontaneous).
Jan. 9, 1907 [42 days after inoculation].	1457 cc.	2157	Intrap.	L.F.	5 cc.	K.	57 days	No tuberculosis.
		2158	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2159	Intrap.	L.H.	,,	,,	,,	No tuberculosis.
		2160	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2161	Intrap.	R.F.	,,	,,	,,	No tuberculosis.
		2162	Subcut.	,,	,,	,,	,,	Slight general tuberculosis.
		2163	Intrap.	R.H.	,,	,,	,,	No tuberculosis.
		2164	Subcut.	,,	,,	,,	,,	No tuberculosis.
Jan. 23, 1907 [56 days after inoculation].	—	2195	Intrap.	L.F.	5 cc.	K.	61 days	No tuberculosis.
		2196	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2197	Intrap.	L.H.	,,	,,	,,	No tuberculosis.
		2198	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2199	Intrap.	R.F.	,,	,,	,,	Slight general tuberculosis.
		2200	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2201	Intrap.	R.H.	,,	D.	41 days	General tuberculosis.
		2202	Subcut.	,,	,,	K.	61 days	No tuberculosis.
Feb. 1, 1907 [65 days after inoculation].	1800 cc.	2216	Intrap.	L.F.	5 cc.	K.	76 days	General tuberculosis.
		2217	Subcut.	,,	,,	,,	,,	General tuberculosis.
		2218	Intrap.	L.H.	,,	,,	,,	No tuberculosis.
		2219	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2220	Intrap.	R.F.	,,	,,	,,	General tuberculosis.
		2221	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2222	Intrap.	R.H.	,,	,,	,,	No tuberculosis.
		2223	Subcut.	,,	,,	,,	,,	No tuberculosis.
Feb. 14, 1907 [78 days after inoculation].	—	2251	Intrap.	L.F.	5 cc.	K.	69 days	No tuberculosis.
		2252	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2253	Intrap.	L.H.	,,	,,	,,	No tuberculosis.
		2254	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2255	Intrap.	R.F.	,,	,,	,,	General tuberculosis.
		2256	Subcut.	,,	,,	,,	,,	General tuberculosis.
		2257	Intrap.	R.H.	,,	,,	,,	No tuberculosis.
		2258	Subcut.	,,	,,	,,	,,	No tuberculosis.

GUINEA-PIGS INOCULATED WITH THE MILK OF COW 77—*continued.*

Date.	Total yield of milk in 24 hours.	No. of Guinea-pig.	Mode of Injection.	Quarter of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
Feb. 27, 1907 [91 days after inoculation].	1150 cc.	2280	Intrap.	L.F.	5 cc.	K.	68 days	No tuberculosis.
		2281	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2282	Intrap.	L.H.	,,	,,	,,	No tuberculosis.
		2283	Subcut.	,,	,,	,,	,,	No tuberculosis.
		2284	Intrap.	R.F.	,,	,,	,,	No tuberculosis.
		2285	Subcut.	,,	,,	,,	,,	General tuberculosis.
		2286	Intrap.	R.H.	,,	,,	,,	General tuberculosis.
		2287	Subcut.	,,	,,	,,	,,	General tuberculosis.
March 20, 1907 [112 days after inoculation].	1360 cc.	2309	Intrap.	L.F.	Each received the centrifuged deposit from 100 cc. of milk.	K.	63 days	No tuberculosis.
		2310	Intrap.	L.H.		,,	,,	General tuberculosis.
		2311	Intrap.	R.F.		,,	,,	General tuberculosis.
		2312	Intrap.	R.H.		,,	,,	General tuberculosis.
		2313	Intrap.	L.F.	5 cc.	,,	65 days	No tuberculosis.
		2314	Subcut.	..	,,	D.	9 days	No tuberculosis.
		2315	Intrap.	L.H.	,,	,,	10 days	Slight T. of omentum Death from pseudo-tuberculosis.
		2316	Subcut.	..	,,	K.	65 days	No tuberculosis.
		2317	Intrap.	R.F.	,,	,,	,,	General tuberculosis.
		2318	Subcut.	,,	,,	,,	66 days	General tuberculosis.
		2319	Intrap.	R.H.	,,	,,	65 days	General tuberculosis.
		2320	Subcut.	,,	,,	D.	41 days	Slight tuberculosis.
May 2, 1907 [155 days after inoculation].	975 cc.	2402	Intrap.	L.F.	The entire yield of the cow for 24 hours was centrifuged, and the deposit injected.*	K.	63 days	General tuberculosis.
		2403	Intrap.	,,		D.	23 days	Pseudo-tuberculosis.
		2404	Subcut.	,,		K.	63 days	No tuberculosis.
		2405	Intrap.	L.H.		,,	,,	No tuberculosis.
		2406	Intrap.	,,		,,	,,	Slight general tuberculosis.
		2407	Subcut.	,,		,,	..	No tuberculosis.
		2408	Intrap.	R.F.		D.	6 days	No tuberculosis.
		2409	Intrap.	,,		K.	53 days	General tuberculosis.
		2410	Subcut.	,,		..	..	Slight general tuberculosis.
		2411	Intrap.	R.H.		,,	,,	No tuberculosis.
		2412	Intrap.	..		,,	,,	No tuberculosis.
		2413	Subcut.	,,		,,	,,	Slight general tuberculosis.

* The deposit from the milk of each of the four quarters was divided equally among three guinea-pigs.

RABBITS INOCULATED WITH THE MILK OF COW 77.

Date.	No. of Rabbit.	Mode of Injection.	Quarter of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
May 3, 1907 [156 days after inoculation].	1286	Subcut.	Milk from all quarters, mixed.	10 cc.	K.	92 days	Local lesion, and one tubercle in lung.
	1287	Intrap.		,,	,,	,,	Three or four tubercles in omentum, one in a kidney, and one in the lung.

RABBITS INOCULATED WITH EMULSIONS OF TISSUES OF GUINEA-PIGS INJECTED WITH THE MILK OF COW 77.

Date of Injection.	Source of Tissue Emulsion injected.	No. of Rabbit.	Mode of Injection.	Killed or Died.	Duration of Life.	Result.
May 7, 1907	G.P. 2287 (Inguinal Gland).	1288	Subcut.	K.	86 days	Local tuberculosis only.
May 22, 1907	G.P. 2310 (Omentum).	1295	Subcut.	D.	9 days	Death due apparently to local suppuration.
,,	G.P. 2311 (Spleen).	1296	Subcut.	K.	119 days	Local lesion and slight tuberculosis of lungs.
,,	,,	1297	Subcut.	D.	15 days	Local tuberculosis only. Cause of death not determined.
,,	G.P. 2312 (Omentum).	1298	Subcut.	K.	91 days	Local tuberculosis and tuberculosis of the lungs.
May 24, 1907	G.P. 2317 (Spleen).	1299	Intrap.	K.	62 days	Very slight tuberculosis of omentum.
,,	G.P. 2319 (Spleen).	1300	Intrap.	D.	22 days	Local tuberculosis. Death from pseudo-tuberculosis.
July 4, 1907	G.P. 2413 (Inguinal Gland).	1373	Intrav.	K.	127 days	Slight tuberculosis of lungs.
,,	G.P. 2409 (Omentum and Spleen).	1374	Intrav.	K.	127 days	Tuberculosis of lungs.
	,,	1375	Subcut.	K.	127 days	Local lesion only.

EXPERIMENT C.

COW 61.

Cow 61 was an old cow, and had lived at Blythwood nearly five years; she had been tested with tuberculin seven times in all, the last test having been made on July 2, 1907. Her last calf was born on October 15, 1905, and for several months the amount of milk yielded from all the quarters had rarely exceeded one-and-a-half pints.

The R.F. quarter had for some time been practically 'dry,' and it had been possible to obtain from it only a small quantity of serous fluid and yellow clots.

First Inoculation—August 6, 1907.

Subcutaneous inoculation of culture derived from the ischiatic gland of Calf 1145 (Virus H 81. "P.W.").

Dose—100·0 milligrammes.

Second Inoculation—November 4, 1907. [90 days after 1st inoculation.]

Intravenous inoculation of culture derived from a human spleen through Guinea-pig 2274, Virus H 83. "G.C."

Dose—150·0 milligrammes.

Killed when in good health—*April 16, 1909.* [619 days after the first inoculation and 529 days after the 2nd inoculation.]

Tuberculin Tests.

I. October 24, 1907. [79 days after 1st inoculation.] Dose, 3·0 cc. of tuberculin. No reaction. Rise of temperature, 0·2° C.

II. October 30, 1907. [85 days after 1st inoculation.] Dose, 6·0 cc. of tuberculin.

III. February 21, 1908. [109 days after 2nd inoculation.] Dose, 1·0 cc. of tuberculin. Reacted Rise of temperature, 1·5° C.

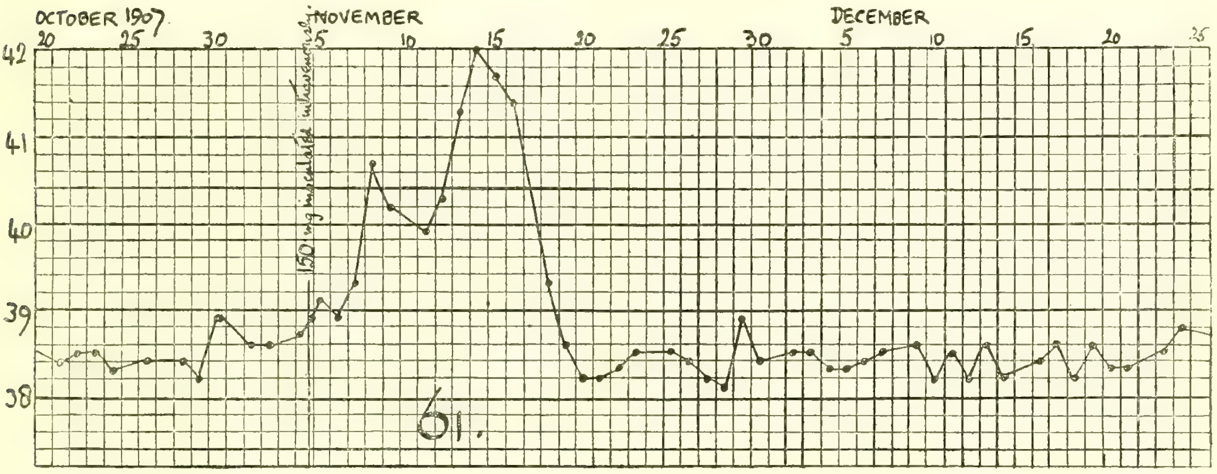
IV. May 20, 1908. [198 days after 2nd inoculation.] Dose, 3·0 cc. of tuberculin. No reaction. Rise of temperature, 0·4° C.

V. November 4, 1908. [366 days after 2nd inoculation.] Dose, 3·0 cc. of tuberculin. No reaction. Rise of temperature, 0·1° C.

Temperature.

The temperature remained normal after the subcutaneous inoculation on August 6, 1907.

Four days after the intravenous inoculation on November 4, 1907, the temperature rose to 40·7° C.; it reached a maximum of 42·0° C. on the 10th day, and then fell rapidly to the normal; the period of pyrexia lasted 12 days. Subsequently (for 17 months) the temperature was normal.



Clinical Notes.

1st Inoculation.—A small hemispherical tumour developed at the site of the subcutaneous inoculation; on October 18 it measured 7 cm. in diameter; the adjacent prescapular gland was not appreciably enlarged.

The cow remained well.

2nd Inoculation.—On November 8, four days after the intravenous inoculation, the cow first appeared to be unwell, and refused her food. On November 11 and 12 she was very ill, the respirations were quick, and the temperature rising (40·3° C.). On November 15 the temperature was very high (41·7° C.), but the cow was much better, and the respirations appeared to be normal.

The cow remained well subsequently.

Microscopical Examinations of Milk and Faeces Subsequent to the Intravenous Inoculation; and Notes on the Condition of the Udder.

On November 5, 24 hours after inoculation, smears from thick mucoid deposit obtained from the R.F. quarter, and deposit of centrifuged milk from the L.H. quarter, were examined; no tubercle bacilli were seen in either.

On November 6, 48 hours after inoculation, the centrifuged deposit of milk from the L.H. quarter was examined; two or three groups of bodies stained red which resembled tubercle bacilli were seen; another smear showed nothing of a doubtful nature.

No acid-fast bacilli were seen in an emulsion of faeces examined on the same day.

On November 7, 3 days after inoculation, one of the coagula from the R.F. quarter, and one from the L.F. quarter, were examined; chains of streptococci were seen, but no tubercle bacilli. The centrifuged deposit of milk from the L.H. quarter was also examined; no tubercle bacilli were seen. No acid-fast bacilli were seen in an emulsion of the faeces examined on the same day.

On November 9, 5 days after inoculation, the centrifuged deposit (stringy and muco-purulent in character) of mixed milk from the L.F., L.H., and R.H. quarters was examined; no tubercle bacilli were seen.

The centrifuged deposit of mixed milk from the same quarters was examined two days later with the same result.

On November 12, 8 days after inoculation, some muco-pus from the mixed milk was examined; no tubercle bacilli were seen.

On November 14, 10 days after inoculation, centrifuged deposit of mixed milk from the R.H. and L.H. quarters was examined; no tubercle bacilli were seen. Coagulum from the R.H. quarter was examined with the same result. Two days later a smear from an emulsion of faeces was examined; no tubercle bacilli were seen.

No further microscopical examinations were made during November or December, and in January, 1908, the secretion of milk practically ceased.

On April 14, 1908, 162 days after inoculation, some pus was expressed from the two forequarters of the udder and examined microscopically. It was found to contain very numerous tubercle bacilli and the cells were composed largely of polymorphonuclears with scattered lymphocytes and alveolar cells.

On the following day 50·0 cc. of sterile salt solution were injected into the L.F. quarter and 50·0 cc. into the R.F., and then after manipulating the quarters with the object of flushing out the smaller ducts the fluid was withdrawn into the flasks; not all the fluid was recovered and that which was obtained was slightly milky and contained small flakes and flocculi. Tubercle bacilli were easily found in the fluid. Guinea-pigs and rabbits were inoculated with the fluid (*see* table).

On April 21, 1908, some pus was expressed from the two hind quarters. Fairly numerous tubercle bacilli were seen in smears, definitely less numerous than in the pus from the fore quarters.

On June 2 drops of pus from the L.F. and the R.F. quarters were again examined; tubercle bacilli were numerous in both.

Towards the end of June it was observed that three of the quarters of the udder had become enlarged and somewhat indurated and that there was a sero-purulent discharge from the two fore teats. A fortnight later there was a distinct increase in the size of the three quarters; the L.F. and L.H. were uniformly indurated, the R.F. was indurated and nodular; the R.H. showed no alteration in size.

On July 1 each of the quarters was milked and altogether 450·0 cc. of yellow tenacious muco-purulent fluid were withdrawn; there was practically none in the R.H. quarter. The fluid contained very numerous tubercle bacilli. [With the exception of a few drops for microscopical examination nothing had been withdrawn from the udder for about six months.]

On July 2 250·0 cc. were withdrawn from the four quarters; and on July 3 only 110·0 cc. were obtained, and this was more serous but very turbid.

On July 17 a few drops of muco-purulent fluid were expressed from each quarter. Tubercle bacilli were numerous in the fluid from three quarters; in that from the R.H. quarter a few clumps of very short tubercle bacilli were seen, quite different from those in the other quarters.

On August 6 pus from the L.F., L.H., and R.F. quarters was microscopically examined. Tubercle bacilli were moderately numerous in the pus from each quarter, but distinctly less numerous than when first examined.

On September 15 pus or fluid was expressed from each of the four quarters and microscopically examined:—

From the L.F. quarter yellowish muco-pus with some small opaque flakes in it was obtained; a smear preparation from it showed a moderate number of tubercle bacilli, moderately numerous in places, and occasionally in clumps.

From the L.H. quarter thick tenacious yellow pus was obtained; a smear preparation showed scattered beaded tubercle bacilli with a few clumps.

From the R.F. quarter yellow muco-pus was obtained; a smear preparation showed scattered beaded tubercle bacilli, mostly single, and a few clumps.

From the R.H. quarter milky watery fluid was obtained; a smear preparation showed a few small groups of very short acid-fast bacilli, some like granules; the cells were chiefly polymorphonuclears.

On October 6 pus or fluid expressed from each of the quarters was microscopically examined:—

In yellow muco-pus from the L.F. quarter a moderate number of tubercle bacilli was seen.

In tenacious yellow pus from the L.H. quarter tubercle bacilli were moderately numerous.

In serous fluid containing small white flakes from the R.F. quarter a moderate number of tubercle bacilli was seen.

In serous fluid from the R.H. quarter one tubercle bacillus was seen.

On October 15, nine days later, milk was obtained from the R.H. quarter; from the other quarters pus was obtained, and this was diluted with saline for microscopical examination and animal inoculation.

The fluid withdrawn from the R.H. quarter was like milk, and on standing a layer of cream separated. In a smear preparation two small groups of acid-fast granules or short bacilli, the majority oval, some almost spherical, were seen, also a good many short chains of cocci. Cells were not numerous and mainly polymorphonuclears; a few alveolar cells and mononuclears were seen.

In the pus from the L.F. quarter tubercle bacilli were moderately numerous; in that from the L.H. a moderate number was seen; in the pus from the R.F. quarter also a moderate number of tubercle bacilli was seen, chiefly in small groups (in the pus from this quarter a calcareous grain was found).

On January 14, 1909, pus or fluid expressed from each of the quarters was microscopically examined:—

In yellow pus from the L.F. quarter moderately numerous tubercle bacilli were seen the majority long and beaded; only about 5·0 cc. of the pus were obtained, it was thick and tenacious and issued from the teat like paint from a tube.

From the L.H. quarter rather less than 1·0 cc. of pus of similar appearance and consistency was obtained; a moderate number of tubercle bacilli was seen in the smear preparation made from it.

In watery fluid with whitish flakes from the R.F. quarter (a few drops only were expressed) scattered tubercle bacilli were seen, much less numerous than in the pus from the L.H. quarter. In turbid watery fluid containing a few flakes of yellow pus from the R.H. quarter (only a few drops were obtained) no tubercle bacilli were seen.

No organisms other than tubercle bacilli were seen in any of the smear preparations.

On April 15, 1909, the milk sinuses of three of the quarters (L.F., R.F., and R.H.) were washed out with normal salt solution. The apparatus used for each quarter was a flask stoppered with a rubber cork containing two glass tubes; one a short one was for the passage of air and was plugged with wool, the other was a long one and extended to the bottom of the flask; to the outer extremity of the long tube was attached by means of semi-pressure tubing a metal catheter which was passed through the teat canal; each flask contained 100·0 cc. of fluid and this was forced into the sinuses by means of an air pump which was fixed on to the air tube.

In the case of the two fore quarters the milk sinuses appeared to be much contracted and it was possible to inject only a small quantity of the fluid at one time, and the fluid recovered was only slightly milky. The right hind quarter took all the saline and the fluid recovered was opaque milky and deposited on standing yellow pus. The teat canal of the left hind quarter was plugged with dry cheesy substance which blocked up the eye of the cannula and on this account the attempt to wash out this quarter was abandoned. The teat canals of each of the other quarters contained yellow pus which was squeezed out before inserting the cannula.

The amount of fluid recovered from each of the three quarters was about 95 cubic centimetres and this was used to inoculate six rabbits intravenously and three guinea-pigs intraperitoneally, two rabbits and one guinea-pig from each quarter; the dose in each case was 4·0 cc. of the fluid.

Microscopical Examinations.

Pus from the teat canals	L.F. Numerous long and beaded tubercle bacilli.
	L.H. A moderate number of tubercle bacilli.
	R.H. No tubercle bacilli. A few acid-fast granules.

Watery fluid recovered from the sinuses after the injection of saline.	L.F. No tubercle bacilli. R.F. A few tubercle bacilli. R.H. A few tubercle bacilli, long and beaded.

Since the last note the mamma had undergone appreciable diminution in size ; the left fore quarter was still very knotty and indurated, the hind quarters felt uniformly indurated.

The general health of the cow was good.

She was killed the following day, April 16, 1909.

Weights.

	cwt.	qrs.	lbs.
August 6, 1907	8	2	2
April 16, 1909	7	1	3

Loss of weight.—1 cwt. 0 qrs. 27 lbs.

POST-MORTEM EXAMINATION.

The carcass was fat.

Seat of Inoculation.—There was no sign of tuberculosis at the seat of the subcutaneous inoculation on the left side of the neck.

Prescapular Glands.—The left prescapular gland measured 6 by 2·5 by 2 cm. and was normal on section. The right measured 6 by 2·5 by 1·5 cm. and was also normal on section.

Thorax.

Lungs—The lungs were crepitant and showed no areas of collapse or consolidation ; nothing abnormal was seen from the surface. In the depth of the right caudal lobe towards the posterior extremity there was a dense yellow gritty caseous nodule about 1·2 cm. in diameter, irregular in outline, and formed apparently by two or three nodules aggregated together ; in the lung tissue immediately around it were three or four discrete firm caseous nodules the largest the size of a hempseed ; adjacent to the above group was a nodule 2 cm. in diameter composed of a number of fibrous-walled cysts filled with tenacious muco-pus. There was also a pea-sized calcareous nodule with fibrous walls.

In the posterior part of the left caudal lobe three hard nodules were found after cutting the lung into thin transverse strips ; the largest of these nodules was perhaps 1 cm. in diameter and all showed an irregular calcareous centre and a thick fibrous wall ; the calcareous centre (the largest about 5 mm. in greatest diameter) readily shelled out and under a hand-lens showed its surface covered with little excrescences causing it to resemble a piece of coral. Within the fibrous wall of one of the nodules there was a small quantity of yellow pus.

The rest of the lung was normal.

Thoracic Glands.—The long mediastinal gland contained a mass measuring 3·5 by 3 by 1·5 cm. composed of dense canary-yellow caseous areas set in a scanty matrix of fibrous tissue. Elsewhere in the cortex there were two nodules one the size of a pea the other that of a hempseed with caseous centres and fibrous margins.

Other thoracic glands were normal.

Pleura and Heart.—Normal.

Abdomen.

Omentum and Peritoneum, Spleen, Liver, and Kidneys.—Normal.

Pancreas.—In the head of the pancreas there was a mass composed of yellow caseo-purulent nodules set in white fibrous tissue ; the largest was rather more than 1 cm. in diameter ; towards the middle of the pancreas there were two similar encapsuled caseous and softened nodules ; the purulent substance contained calcareous grains.

Suprarenal Bodies.—The left suprarenal body contained altogether about twenty dense yellow gritty caseous nodules the largest 5 mm. in diameter. The right contained ten similar nodules.

Portal, Renal, Lumbar, and Iliac Glands.—Normal.

Alimentary Tract.

Tongue, Pharynx, Palate, Tonsils, Intestines and Mesenteric Glands.—Normal.

Genito-Urinary System.

Uterus.—Normal.

Udder.—The udder on the whole was small. The right fore-quarter was much atrophied and was smaller than any of the others ; the milk sinuses were almost completely, and the milk ducts completely, obliterated ; all that remained of the milk reservoir was a small smooth-walled cavity with short diverticulum, above the root of the teat, and this contained a small quantity of pus ; the tissue of the quarter was very dense, and nodules could be felt in various parts of it. On section it was composed of a network of fibrous tissue enclosing light brownish islands of atrophied glandular tissue ; in the peripheral parts of the quarter chiefly, *i.e.*, around the margins of the base and the root of the teat, was a number of encapsuled caseo-calcareous nodules, the largest the size of a kidney bean ; in the middle of the quarter there were sparsely-scattered caseous gritty nodules the largest the size of a hempseed.

The left fore-quarter was larger than the right but smaller than the two hind quarters, and was very knotty and indurated, the milk sinus except for a small cavity about 2 cm. in length was obliterated ; the tissue of the quarter was even more fibrous than that of the right fore, and was closely beset with encapsuled caseo-calcareous nodules ranging in size from a millet seed to a large pea. Around the root of the teat there were some larger nodules up to 1·5 cm. in diameter, some of which were brownish translucent and beset with calcareous foci, others caseo-calcareous and encapsuled.

The two hind-quarters were of about equal size ; the tissue was very fibroid, and showed on section a white fibrous network and brownish translucent tissue representing the glandular tissue ; there was no definite lobulation. Scattered evenly throughout both of the quarters were caseous gritty nodules with fibrous walls varying up to 5 mm. in diameter.

The milk sinuses and ducts of the left hind quarter were completely obliterated, the former being represented by a small cavity lined with granulation tissue and filled with yellow pus, which did not communicate with the teat canal ; the teat canal was filled with cheesy substance.

In the right hind quarter there were a good many patent milk ducts, and the milk sinuses were present, though apparently a good deal contracted ; the walls of the sinuses and ducts were smooth, and the sinuses contained a small quantity of turbid fluid.

Supramammary Glands.—These glands showed no naked-eye evidence of tuberculosis.

Peripheral Lymphatic Glands.—All the peripheral glands were examined and found normal.

Microscopical Examination.

Emulsion of Left Prescapular Gland.—No tubercle bacilli.

Emulsion of Long Mediastinal Gland.—A moderate number of tubercle bacilli.

Emulsion of a Nodule from a Suprarenal Body.—Numerous tubercle bacilli.

Emulsion of a Nodule from the Pancreas.—A moderate number of tubercle bacilli, short and uniformly stained.

Smear of Muco-pus from a Nodule in the Lung.—Numerous tubercle bacilli.

Emulsion of a Supramammary Gland.—A moderate number of tubercle bacilli.

Animals Inoculated.

Guinea-pigs.—Two guinea-pigs, Nos. 3716 and 3717, were inoculated intraperitoneally with an emulsion made from the left prescapular gland ; they were killed after 77 days, and showed slight general tuberculosis.

Two, Nos. 3718 and 3719, were inoculated intraperitoneally with an emulsion of a nodule from the long mediastinal gland; they died of general tuberculosis in 26 and 28 days.

Two, Nos. 3714 and 3715, were inoculated intraperitoneally with an emulsion of a supramammary gland. They died of general tuberculosis in 34 and 21 days.

PIG 99.

(Age—5 months 10 days.)

Feeding with milk of Cow 61, after her subcutaneous inoculation with the culture derived from Calf 1145, Virus H 81. "P.W."

Dose—The pig was fed daily for 21 days, receiving in all 6535 cc. of milk. The feeding commenced on August 10, 1907 (4 days after the inoculation of the cow) and ended on August 30, 1907.

Killed when in good health—October 28, 1907. [79 days after the commencement of the experiment.]

Clinical Notes.

The pig showed no sign of ill-health during the experiment, and grew normally.

Tuberculin Test.

October 24, 1907 (78 days). No reaction. No rise of temperature.

Weights.

	cwt.	qrs.	lbs.
August 10, 1907	1	2	21
October 28, 1907	2	0	24

Total gain of weight.—2 qrs. 3 lbs.

Average rate of gain per week—5·0 lbs.

POST-MORTEM EXAMINATION.

The carcass was fat.

There was no sign of tuberculosis.

All the organs and lymphatic glands were examined and found to be perfectly healthy.

GUINEA-PIGS INOCULATED WITH MILK OF COW 61.

Date.	No. of Guinea-pig.	Mode of Injection.	Quarter of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
Aug. 2, 1907 [before inoculation].	2512	Intrap.	L.F	5·0 cc.	K.	45 days	Normal.
	2513	,,	,,	5·0 cc.	,,	,,	Normal.
	2514	,,	L.H.	5·0 cc.	,,	,,	Normal.
	2515	,,	,,	5·0 cc.	,,	,,	Normal.
	2516	,,	R.F.	4·0 cc.	,,	,,	Normal.
	2517	,,	,,	4·0 cc.	,,	,,	Normal.
	2518	,,	R.H.	5·0 cc.	,,	,,	Normal.
	2519	,,	,,	5·0 cc.	,,	,,	Normal.
Aug. 7, 1907 [24 hours after subcutaneous inoculation with virus H 81. P.W.].	2524	Intrap.	L.F.	10·0 cc.	K.	54 days	Normal.
	2525	,,	,,	10·0 cc.	,,	,,	Normal.
	2526	,,	L.H.	10·0 cc.	,,	,,	Normal.
	2527	,,	,,	10·0 cc.	,,	,,	Normal.
	2528	,,	R.H.	10·0 cc.	,,	,,	Normal.
	2529	,,	,,	10·0 cc.	,,	,,	Normal.
	2530	,,	R.F.	0·5 cc.	,,	,,	Normal.
	2531	Intrap.	L.F.	Each received the centrifuged deposit of 30·0 cc. plus 10·0 cc. of uncentrifuged milk.	K.	41 days	Normal.
	2532	,,	,,		,,	,,	Normal.
	2533	,,	L.H.	Do. do.	,,	,,	Normal.
	2534	,,	,,		,,	,,	Normal.
	2535	,,	R.H.	Do. do.	,,	,,	Normal.
	2536	,,	,,		,,	,,	Normal.
Aug. 9, 1907 [3 days after inoculation].	2537	Intrap	L.F.	10·0 cc.	K.	53 days	Normal.
	2538	,,	,,	10·0 cc.	,,	,,	Normal.
	2539	,,	L.H.	10·0 cc.	,,	,,	Normal.
	2540	,,	,,	10·0 cc.	,,	,,	Normal.
	2541	,,	R.H.	10·0 cc.	,,	,,	Normal.
	2542	,,	,,	10·0 cc.	,,	,,	Normal.
	2543	,,	R.F.	About 0·5 cc.	,,	,,	Normal.
	2544	Intrap.	L.F.	Each received the centrifuged deposit of 30·0 cc. plus 10·0 cc. of uncentrifuged milk.	K.	46 days	Normal.
	2545	,,	,,		,,	,,	Normal.
	2546	,,	L.H.	Do. do.	,,	,,	Normal.
	2547	,,	,,		,,	,,	Normal.
	2548	,,	R.H.	Do. do.	,,	,,	Normal.
	2549	,,	,,		,,	,,	Normal.
Aug. 13, 1907 [7 days after inoculation].	2550	Intrap.	L.F., L.H., and R.H.	Each received 10·0 cc. of mixed milk from these quarters.	K.	58 days	Normal.
	2551	,,			,,	,,	Normal.
	2552	,,			,,	,,	Normal.
	2553	,,			,,	,,	Normal.
	2554	,,	R.F.	10·0 cc. drawn by hand and filtered.	,,	,,	Chronic general tuberculosis

GUINEA-PIGS INOCULATED WITH MILK OF COW 61—*continued.*

Date.	No. of Guinea-pig.	Mode of Injection.	Quarter of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
Aug. 13, 1907 [7 days after inoculation]—*continued.*	2555	Intrap.	L.F., L.H., and R.H.	Mixed milk. Each guinea-pig received the centrifuged deposit of 30·0 cc. plus 10·0 cc. of uncentrifuged milk.	K.	49 days	Normal.
	2556	,,			,,	,,	Normal.
	2557	,,			,,	58 days	Normal.
	2558	,,			,,	,,	Normal.
Aug. 20, 1907 [14 days after inoculation].	2570	Intrap.	L.F.	10·0 cc.	K.	62 days	Normal.
	2571	,,	,,	10·0 cc.	,,	,,	Normal.
	2572	,,	L.H.	10·0 cc.	,,	,,	Normal.
	2573	,,	,,	10·0 cc.	,,	,,	Normal.
	2568	,,	R.H.	10·0 cc.	,,	,,	Normal.
	2569	,,	,,	10·0 cc.	,,	,,	Norma
	2566	,,	R.F.	1·5 cc.	,,	,,	Normal.
	2567	,,	,,	1·5 cc.	,,	,,	Normal.
Sept. 10, 1907 [35 days after inoculation].	2585	Intrap.	L.F.	10·0 cc.	K.	51 days	Normal.
	2586	,,	,,	10·0 cc.	,,	,,	Normal.
	2587	,,	L.H.	10·0 cc.	,,	,,	Normal.
	2588	,,	,,	10·0 cc.	,,	,,	Normal.
	2583	,,	R.H.	10·0 cc.	,,	,,	Normal.
	2584	,,	,,	10·0 cc.	,,	,,	Normal.
Sept. 17, 1907 [42 days after inoculation].	2598	Intrap.	L.F.	10·0 cc.	K.	59 days	Normal.
	2599	,,	,,	20·0 cc.	,,	,,	Normal.
	2600	,,	L.H.	Each received the centrifuged deposit of 30·0 cc. plus 10·0 cc. of uncentrifuged milk.	,,	,,	Normal.
	2601	,,	,,		,,	,,	Normal.
	2602	,,	R.H.	Do. do.	,,	,,	Normal.
	2603	,,	,,		,,	,,	Normal.
	2604	,,	R.F.	1·0 cc.	,,	,,	Normal.
Oct. 8, 1907 [63 days after inoculation].	2617	Intrap.	L.F.	10·0 cc.	K.	48 days	Normal.
	2618	,,	,,	10·0 cc.	,,	,,	Normal.
	2613	,,	L.H.	10·0 cc.	,,	,,	Normal.
	2614	,,	,,	20·0 cc.	,,	,,	Normal.
	2615	,,	,,	20·0 cc.	,,	,,	Normal.
	2616	,,	,,	30·0 cc.	D.	9 days	Peritonitis.
	2619	,,	R.H.	20·0 cc.	K.	48 days	Normal.
	2620	,,	,,	30·0 cc.	,,	,,	Normal.
Oct. 12, 1907 [67 days after inoculation].	2622	Intrap.	L.H.	10·0 cc. of milk withdrawn with catheter.	K.	54 days	Normal.
	2623	,,	,,		,,	,,	Normal.
	2624	Intrap.	L.H.	10·0 cc. of milk withdrawn by hand.	,,	,,	Normal.
	2625	,,	,,		,,	,,	Normal.

GUINEA-PIGS INOCULATED WITH MILK OF COW 61—*continued.*

Date.	No. of Guinea-pig.	Mode of Injection.	Quarter of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
Oct. 29, 1907 [84 days after inoculation].	2650	Intrap.	L.F.	10·0 cc.	K.	65 days	Normal.
	2651	,,	,,	8·0 cc.	,,	,,	Normal.
	2652	,,	L.H.	10·0 cc.	,,	,,	Normal.
	2653	,,	,,	10·0 cc.	,,	,,	Normal.
	2654	,,	R.H.	10·0 cc.	,,	,,	Normal.
	2655	,,	,,	10·0 cc.	,,	,,	Normal.
	2656	,,	R.F.	Small quantity withdrawn with catheter.	,,	,,	Normal.
	2657	,,	,,	About 5·0 cc. withdrawn by hand.	,,	,,	Normal.

Date of Inoculation.	Total yield of Milk in 24 hours.	No. of Guinea-pig.	Mode of Inoculation.	Quarter of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
Nov. 5, 1907 [24 hours after second (intravenous) inoculation with Virus H 83. "G.C."].	L.F. 10·0 cc.	2677	Intrap.	L.F.	5·0 cc.	K.	59 days	Slight general tuberculosis.
		2678	,,	,,	5·0 cc.	,,	,,	Slight general tuberculosis.
	L.H. 65·0 cc.	2671	,,	L.H.	10·0 cc.	,,	,,	Slight general tuberculosis.
		2672	,,	,,	20·0 cc.	,,	,,	Slight general tuberculosis.
	R.H. 40·0 cc.	2675	,,	R.H.	10·0 cc.	,,	,,	General tuberculosis.
		2676	,,	,,	10·0 cc.	,,	,,	Slight general tuberculosis.
	R.F. 6·0 cc.	2673	,,	R.F.	About 3·0 cc. of filtrate (uncentrifuged) each.	,,	,,	Slight general tuberculosis.
		2674	,,	,,		,,	,,	Slight general tuberculosis.
Nov. 6, 1907 [48 hours after reinoculation].	L.F. 6·0 cc.	2681	Intrap.	L.F.	About 6·0 cc.	K.	61 days	Slight general tuberculosis.
	L.H. 62·0 cc.	2684	,,	L.H.	10·0 cc.	,,	,,	Early general tuberculosis.
		2685	,,	,,	10·0 cc.	,,	,,	General tuberculosis.
	R.H. 35·0 cc.	2682	,,	R.H.	10·0 cc.	,,	,,	Early general tuberculosis.
		2683	,,	,,	20·0 cc.	,,	,,	Early general tuberculosis.
	R.F. 2·0 cc.	2686	,,	R.F.	About 2·0 cc. of filtrate (uncentrifuged).	,,	,,	General tuberculosis.
Nov. 7, 1907 [3 days after reinoculation].	L.F. 10·0 cc.	2693	Intrap.	L.F.	10·0 cc.	K.	64 days	Early general tuberculosis.
	L.H. 50·0 cc.	2689	,,	L.H.	10·0 cc.	,,	,,	Slight general tuberculosis.
		2690	,,	,,	10·0 cc.	,,	,,	General tuberculosis.
	R.H. 40·0 cc.	2691	,,	R.H.	10·0 cc.	,,	,,	No tuberculosis.
		2692	,,	,,	10·0 cc.	,,	,,	Early general tuberculosis.
	R.F. 1·0 cc.	2694	,,	R.F.	1·0 cc. of filtrate.	,,	,,	No tuberculosis.
Nov. 9, 1907 [5 days after reinoculation].	110·0 cc.	2708	Intrap.	L.F. L.H. & R.H.	Each received 20·0 cc. of mixed milk from these quarters.	K.	62 days	Early general tuberculosis.
		2709	,,			D.	6 days	No tuberculosis. Cause of death not determined.
Nov. 11, 1907 [7 days after reinoculation].	65·0 cc.	2711	Intrap.	L.F. L.H. & R.H.	Each received 20·0 cc. of mixed milk.	K.	60 days	Early general tuberculosis.
		2712	,,			,,	,,	Slight general tuberculosis.

GUINEA-PIGS INOCULATED WITH MILK OF COW 61—*continued.*

Date of Inoculation.	Total yield of Milk in 24 hours.	No. of Guinea-pig.	Mode of Inoculation.	Quarter of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
Nov. 12, 1907 [8 days after reinoculation].	24·0 cc.	2713	Intrap.	L.F. L.H. & R.H.	10·0 cc. of mixed milk, filtered.	K.	59 days	Early general tuberculosis.
		2714	,,		14·0 cc. of mixed milk, filtered.	,,	,,	Early general tuberculosis.
Nov. 14, 1907 [10 days after reinoculation].	L.F. 1·0 cc. L.H. 20·0 cc. R.H. 10·0 cc.	2727	Intrap.	L.F.	About 1·0 cc.	K.	63 days	No tuberculosis.
		2725	,,	L.H.	10·0 cc.	,,	,,	Early general tuberculosis.
		2726	,,	,,	10·0 cc.	,,	,,	General tuberculosis of moderate severity.
		2724	,,	R.H.	10·0 cc.	,,	,,	No tuberculosis.
Nov. 16, 1907 [12 days after reinoculation].	L.H. 18·0 cc. R.H. 18·0 cc.	2741	Intrap.	L.H.	18·0 cc.	D.	8 days	An acute infection.
		2740	,,	R.H.	18·0 cc.	K.	69 days	Slight general tuberculosis.
Nov. 19, 1907 [15 days after reinoculation].	L.H. 20·0 cc. R.H. 18·0 cc.	2751	Intrap.	L.H.	10·0 cc.	K.	69 days	No tuberculosis.
		2750	,,	R.H.	18·0 cc.	,,	,,	General tuberculosis.
Dec. 18, 1907 [44 days after reinoculation].	L.H. 22·0 cc.	2855	Intrap.	L.H.	About 15·0 cc. Milk very thick—consistency of custard.	K.	97 days	No tuberculosis.
		2856	,,	,,	About 7·0 cc.	D.	86 days	Severe general tuberculosis.
	R.H. 30·0 cc.	2857	,,	R.H.	20·0 cc.	K.	97 days	Spontaneous tuberculosis.
		2858	,,	,,	10·0 cc.	D.	8 days	No tuberculosis.
Jan. 28, 1908 [85 days after reinoculation].	Less than 0·5 cc.	2919	Intrap.	R.H.	Less than 0·5 cc.	K.	62 days	No tuberculosis.

Guinea-pigs inoculated with the fluid obtained after flushing the two forequarters with normal saline solution on April 15, 1908 (see clinical history).

Date.	No. of Guinea-pig.	Mode of Injection.	Quarter of Udder.	Dose.	Killed or Died.	Duration of Life.	Result.
April 15, 1908 [163 days after reinoculation].	3027	Intrap.	L.F.	1·0 cc. of fluid	D.	34 days	Early general tuberculosis.
	3028	Intrap.	R.F.	1·0 cc. of fluid	D.	36 days	General tuberculosis moderately severe.

Guinea-pigs inoculated with the fluid obtained after flushing three of the quarters with normal saline solution on April 15, 1909 (see clinical history).

April 15, 1909 [528 days after reinoculation].	3712	Intrap.	L.F.	4·0 cc. of fluid.	D.	25 days	General tuberculosis.
	3711	Intrap.	R.F.	4·0 cc. of fluid.	D.	34 days	General tuberculosis.
	3713	Intrap.	R.H.	4·0 cc. of fluid.	D.	21 days	General tuberculosis.

RABBITS INOCULATED WITH MATERIAL OBTAINED FROM THE UDDER OF COW 61.

(a) *Inoculation of rabbits with the fluid obtained after flushing the two forequarters with normal saline solution on April 15, 1908 (see clinical history).*

Date.	No. of Rabbit.	Mode of Injection.	Quarter of Udder.	Dose.	Killed or Died.	Duration of Life.	Result.
April 15, 1908 [163 days after reinoculation].	1825	Intrav.	L.F.	1·0 cc. of fluid.	K.	174 days	Very slight T. of lungs and kidneys.
	1826	Intrav.	R.F.	3·0 cc. of fluid.	D.	29 days.	Fairly numerous discrete grey submiliary tubercles in the lungs ; scattered minute foci in the liver.

(b) *Inoculation of rabbits with pus [from L.F., L.H., and R.F. quarters] and milk [from R.H. quarter] on October 15, 1908.*

Oct. 15, 1908 [346 days after reinoculation].	2045	Intrav.	L.F.	Rather larger dose than 2044.	K.	161 days	Tuberculosis of lungs and kidneys (slight).
	2046	Intrav.	L.H.	Do. do.	K.	161 ,,	Tuberculosis of lungs and kidneys.
	2044	Intrav.	R.F.	Small quantity of pus suspended in saline.	K.	161 ,,	Tuberculosis of lungs and one kidney.
	2043	Intrav.	R.H.	About 3·0 cc. of milk.	K.	161 ..	Slight tuberculosis of lungs.

(c) *Rabbits inoculated with the fluid obtained after flushing three of the quarters with normal saline solution on April 15, 1909 (see clinical history).*

April 15, 1909 [528 days after reinoculation].	2305	Intrav.	L.F.	4·0 cc. of fluid	D.	102 days	Slight general tuberculosis apparently insufficient to account for death.
	2306	Intrav.	,,	Do. do.	K.	138 ,,	Slight T. of lungs and kidneys.
	2303	Intrav.	R.F.	Do. do.	K.	138 ,,	Slight T. of lungs, kidneys and mammary gland.
	2304	Intrav.	,,	Do. do.	K.	138 ,,	Slight T. of lungs and kidneys.
	2307	Intrav.	R.H.	Do. do.	K.	138 ,,	Slight T. of lungs only.
	2308	Intrav.	,,	Do. do.	D.	102 ,,	Slight T. of lungs and kidneys. ? cause of death.

GUINEA-PIGS INOCULATED WITH THE FAECES OF COW 61.

Date.	No. of Guinea-pig.	Mode of Injection.	Dose of Faeces.	Killed or Died.	Duration of Life.	Result.
Oct. 12, 1907 [67 days after subcutaneous inoculation].	2627	Intrap.	1·0 cc. } Emulsion of faeces—1 in 20 dilution.	K.	54 days	No tuberculosis.
	2628	,,	1·0 cc.	,,	,,	No tuberculosis.
	2629	,,	0·5 cc.	,,	,,	No tuberculosis.
Nov. 4, 1907 [90 days after inoculation].	2666	Intrap.	1·0 cc. } Emulsion of faeces—1 in 20 dilution.	D.	11 days	? Tuberculosis of omentum. Pseudo - tuberculosis of spleen.
	2667	,,	1·0 cc.	K.	63 days	No tuberculosis.
	2668	,,	2·0 cc.	K.	63 days	No tuberculosis.

Guinea-pigs Inoculated with the Faeces of Cow 61—*continued.*

Date.	No. of Guinea-pig.	Mode of Injection.	Dose of Faeces.	Killed or Died.	Duration of Life.	Result.
Nov. 5, 1907 [24 hours after intravenous inoculation].	2679	Intrap.	0·5 cc. Emulsion of faeces—1 in 10 dilution.	K.	59 days	No tuberculosis.
	2680	,,	0·5 cc.	D.	6 days	No tuberculosis.
Nov. 6, 1907 [48 hours after reinoculation].	2687	Intrap.	1·0 cc. Emulsion of faeces—1 in 20 dilution.	D.	8 days	The cause of death was not apparent.
	2688	,,	1·0 cc.	K.	61 days	No tuberculosis.
Nov. 7, 1907 [3 days after reinoculation].	2695	Intrap.	1·0 cc. Do. do.	D.	7 days	The cause of death was not apparent.
	2696	,,	1·0 cc.	K.	64 days	No tuberculosis.
Nov. 14, 1907 [10 days after reinoculation].	2728	Intrap.	1·0 cc. Do. do.	D.	5 days	Subacute infection.
	2729	,,	1·0 cc.	K.	63 days	Early general tuberculosis.
Nov. 16, 1907 [12 days after reinoculation].	2742	Intrap.	1·0 cc. Do. do.	D.	7 days	No macroscopic evidence of tuberculosis.
	2743	,,	1·0 cc.	K.	6 days	Subacute infection.

GUINEA-PIG INOCULATED WITH THE EPITHELIAL SCALES FROM THE UDDER OF COW 61.

Date.	No. of Guinea-pig.	Mode of Injection.	Material inoculated.	Killed or Died.	Duration of Life.	Result.
Oct. 12, 1907 [67 days after subcutaneous inoculation].	2626	Intrap.	Emulsion of epithelial scales scraped from the udder.	K.	54 days	Normal.

RABBITS INOCULATED WITH CULTURES DERIVED FROM THE MILK OF COW 61.

Date of Inoculation.	Immediate Source of Culture.	Dose in Milli-grammes.	No. of Rabbit.	Mode of Inocula-tion.	Weights.		Duration of Life.	Result.
					Initial.	Final.		
Aug. 5, 1908	On April 15, 1908, a little of the milky fluid withdrawn from the R.F. quarter after flushing with saline was spread on a tube and a culture raised from it.	1·0 mg.	1957	Intrav.	2,000	2,570	K. 83 days	Slight T. of lungs and kidneys.
		0·1 mg.	1958	Intrav.	1,500	2,300	K. 83 ,,	Slight T. of lungs and kidneys.
		0·1 mg.	1959	Intrav.	2,300	2,620	K. 83 ,,	Very slight T. of lungs and one kidney.
Oct. 5, 1908	On Aug. 6, 1908, some of the pus expressed from the L.F. quarter was sown on a culture tube, and a culture was raised from it.	1·0 mg.	2027	Intrav.	2,300	1,450	D. 33 days	Generalised T. not severe.
		0·1 mg.	2028	Intrav.	2,270	2,200	K. 164 ,,	Slight T. of lungs and kidneys.
		0·01 mg.	2029	Intrav.	2,070	2,970	K. 164 ,,	Slight T. of lungs and kidneys.
July 23, 1909	On April 15, 1909, the day before the cow was killed, a little of the fluid withdrawn from the L.F. quarter after flushing with saline was spread on a tube and a culture raised from it.	0·1 mg.	2397	Intrav.	1,500	2,000	K. 75 days	Slight T. of lungs and kidneys.
		0·1 mg.	2398	Intrav.	1,850	2,350	K. 75 ,,	Slight T. of lungs, kidneys and tracheal gland.
		0·01 mg.	2395	Intrav.	1,800	1,100	D. 28 ,,	Slight general tuberculosis.
		0·01 mg.	2396	Intrav	1,650	2,320	K. 75 ,	Slight T. of lungs and kidneys.

EXPERIMENT D.

COW 565.

(Age—4½ years.)

Intravenous inoculation of culture derived from a human lung direct (Virus H 104. "E.R.").

Dose—10·0 milligrammes.

Date of Inoculation—February 18, 1909.

Killed when in good health—August 19, 1909. [182 days after inoculation.]

Clinical Notes.

On February 21, 1909, 10·0 cc. of milk taken from each of 3 quarters (left fore, right fore, and right hind) were centrifuged; there was no deposit. The milk from each quarter was examined microscopically, and no tubercle bacilli were seen. The left hind quarter of the udder was dry when the cow was inoculated.

The following day milk from the R.F. and R.H. quarters was centrifuged; the deposit which was very small in amount was examined microscopically; it consisted in each case of cells mainly leucocytes, a few lymphocytes and alveolar cells; no tubercle bacilli were seen. No colonies of the tubercle bacillus appeared on culture tubes sown from the deposit.

Centrifuged deposits from the milk of the L.F., R.F., and R.H. quarters obtained on the 77th and 133rd days after the inoculation of the cow were examined microscopically, and culture tubes were sown; no tubercle bacilli were seen in any of the smears, and of the culture tubes some remained sterile and others became contaminated.

On July 21, 1909, 153 days after her inoculation, the cow gave birth to a dead foetus (8 months).

> The foetus showed no sign of tuberculosis. Emulsions were made from its spleen and a portal gland (no tubercle bacilli were seen in smears made from either emulsion) and inoculated intraperitoneally each into two guinea-pigs. The guinea-pigs were killed after 41 days and found healthy.

A large amount of thin purulent fluid came away from the uterus at the time of the birth of the foetus. Microscopically this contained very numerous tubercle bacilli.

During the next two or three days there was slight discharge from the vagina, and on July 27 some membranes and purulent fluid were passed. Numerous tubercle bacilli were again demonstrated in the fluid.

On August 5, 1909, centrifuged deposits from the milk of the L.F., R.F., and R.H. quarters were examined microscopically. The smear preparation from the R.F. quarter showed one doubtful tubercle bacillus; no tubercle bacilli were seen in the others.

On August 16, centrifuged deposits from the milk of the three quarters were examined; no tubercle bacilli were seen in any of the smear preparations. Culture tubes sown with the deposit grew other organisms but no tubercle bacilli.

The cow remained well during the experiment, and was in moderately good condition when killed.

Temperature.

There was a very slight rise of temperature commencing on the 11th day after inoculation and lasting twelve days (maximum 40·0° C.). With this exception the temperature was normal during the experiment.

Tuberculin Test.

August 16, 1909. [179 days after inoculation.] Dose 3·0 cc. Reacted. Rise of temperature, 1·7° C.

Weights.

	cwt.	qrs.	lbs.
February 18, 1909	8	2	16
August 19, 1909	7	0	16

POST-MORTEM EXAMINATION.

The carcass was fat.

The Lungs and Thoracic Glands, the Liver, Spleen and Suprarenal Bodies were normal.

Kidneys.—In the medulla of one of the kidneys there were two grey foci of a doubtful nature (a smear showed no tubercle bacilli). The other kidney was normal.

Iliac Glands.—One showed a soft greenish-yellow focus (in a smear preparation made from it no tubercle bacilli were seen).

Mamma.—One quarter (the left hind) was atrophied and fibroid; the others were normal.

Uterus.—The right cornua of the uterus was enlarged, being about twice the size of the left; the mucous membrane was slightly swollen and showed signs of old congestion; it had a brownish-red colour, that of the other cornua being pinkish; the walls were a little thickened but were not otherwise abnormal. There was no naked-eye evidence of tuberculosis anywhere.

All the remaining organs and glands were examined and found normal.

Microscopical Examinations.

Scrapings from the Mucous Membrane of the Right Horn of the Uterus.—Three smear preparations from each of three separate scrapings were examined; one, two, and three tubercle bacilli respectively were found in them after long search.

Guinea-pigs Inoculated.

Two guinea-pigs, Nos. 3870 and 3871 were inoculated intraperitoneally each with a separate emulsion of scrapings from the mucous membrane of the right horn of the uterus. They were killed after 50 days and showed general tuberculosis.

GUINEA-PIGS INOCULATED WITH THE MILK OF COW 565.

Date.	Total yield of milk in 24 hours.	No. of Guinea-pig.	Mode of Inoculation.	Quarter of Udder.	Dose of Milk.	Killed or Died.	Duration of Life	Result.
Feb. 18, 1909 [Before inoculation].	—	3511	Intrap.	L.F.	9·0 cc.	K.	107 days	Healthy.
		3509	„	R.F.	10·0 cc.	K.	107 „	„
		3510	„	R.H.	10·0 cc.	K.	107	„
Feb. 19, 1909 [24 hours after inoculation].	L.F. 1070·0 cc.	3518	Intrap.	L.F.	10·0 cc. + the centrifuged deposit of 30·0 cc. each.	K.	43 days	No tuberculosis.
		3519	„	„		K.	43 „	„ „
	R.F. 1064·0 cc.	3520	„	R.F.		K.	43 „	„ „
		3521	Intrap. and partly Sub-perit.	„		K.	43 „	„ „
	R.H. 1366·0 cc.	3516	Intrap.	R.H.		K.	43 „	„ „
		3517	„	„		K.	43 „	Early slight general tuberculosis.
Feb. 20, 1909 [48 hours after inoculation].	L.F. 1471·0 cc.	3546	Intrap.	L.F.	10·0 cc.	K.	45 days	No tuberculosis.
		3547	„	„	„	K.	45 „	„ „
	R.F. 1015·0 cc.	3544	„	R.F.	„	K.	45 „	„ „
		3545	„	„	„	K.	45 „	„ „
	R.H. 1713·0 cc.	3542	„	R.H.	„	K.	45 „	„ „
		3543	„	„	„	K.	45 „	„ „
Feb. 21, 1909 [3 days after inoculation].	L.F. 1362·0 cc.	3552	Intrap.	L.F.	10·0 cc.	K.	50 days	No tuberculosis.
		3553	„	„	„	K.	50 „	„ „
	R.F. 1012·0 cc.	3550	„	R.F.	„	K.	50 „	„ „
		3551	„	„	„	K.	50 „	„ „
	R.H. 1801·0 cc.	3548	„	R.H.	„	K.	50 „	„ „
		3549	„	„	„	K.	50 „	„ „
Feb. 22, 1909 [4 days after inoculation].	L.F. 1690·0 cc.	3558	Intrap.	L.F.	10·0 cc.	K.	50 days	No tuberculosis.
		3559	„	„	„	K.	50 „	„ „
	R.F. 1098·0 cc.	3556	„	R.F.	„	K.	50 „	„ „
		3557	„	„	„	K.	50 „	„ „
	R.H. 1990·0 cc.	3554	„	R.H.	„	K.	50 „	„ „
		3555	„	„	„	K.	50 „	„ „
Feb. 23, 1909 [5 days after inoculation].	L.F. 1373·0 cc.	3562	Intrap.	L.F.	10·0 cc.	K.	55 days	No tuberculosis.
		3563	„	„	„	K.	55 „	„ „
	R.F. 980·0 cc.	3564	„	R.F.	„	K.	55 „	„ „
		3565	„	„	„	K.	55 „	Slight general tuberculosis.
	R.H. 1620·0 cc.	3560	„	R.H.	„	K.	55 „	General tuberculosis.
		3561	„	„	„	K.	55 „	No tuberculosis.
Feb. 24, 1909 [6 days after inoculation].	L.F. 1285·0 cc.	3572	Intrap.	L.F.	10·0 cc.	K.	55 days	No tuberculosis.
		3573	„	„	„	K.	55 „	„ „
	R.F. 900·0 cc.	3574	„	R.F.	„	K.	55 „	Slight general tuberculosis.
		3575	„	„	„	K.	55 „	No tuberculosis.
	R.H. 1575·0 cc.	3570	„	R.H.	„	K.	55 „	„ „
		3571	„	„	„	K.	55 „	„ „

GUINEA-PIGS INOCULATED WITH THE MILK OF COW 565—*continued.*

Date.	Total yield of milk in 24 hours.	No. of Guinea-pig.	Mode of Inoculation.	Quarter of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
Feb. 25, 1909 [7 days after inoculation].	L.F. 1570·0 cc.	3580	Intrap.	L.F.	10·0 cc.	K.	57 days	General tuberculosis.
		3581	"	"	"	K.	57 "	" "
	R.F. 1105·0 cc.	3578	"	R.F.	"	K.	57 "	" "
		3579	"	"	"	K.	57 "	" "
	R.H. 1860·0 cc.	3576	"	R.H.	"	K.	57 "	No tuberculosis.
		3577	"	"	"	K.	57 "	" "
March 4, 1909 [14 days after inoculation].	L.F. 1600·0 cc.	3589	Intrap.	L.F.	10·0 cc.	K.	50 days	Slight tuberculosis.
		3590	"	"	"	K.	50 "	No tuberculosis.
	R.F. 1150·0 cc.	3591	"	R.F.	"	K.	50 "	General tuberculosis.
		3592	"	"	"	K.	50 "	No tuberculosis.
	R.H. 2030·0 cc.	3587	"	R.H.	"	K.	50 "	General tuberculosis, not severe.
		3588	"	"	"	D.	27 "	No tuberculosis.
March 18, 1909 [28 days after inoculation].	All three quarters 4815·0 cc.	3627	Intrap.	L.F.	10·0 cc.	D.	11 days	No tuberculosis.
		3628	"	"	"	K.	42 "	" "
		3625	"	R.F.	"	K.	42 "	" "
		3626	"	"	"	K.	42 "	" "
		3629	"	R.H.	"	K.	42 "	" "
		3630	"	"	"	K.	42 "	" "
April 1, 1909 [42 days after inoculation].	All three quarters 4300·0 cc.	3657	Intrap.	L.F.	10·0 cc.	D.	32 days	No tuberculosis.
		3658	"	"	"	K.	56 "	" "
		3659	"	R.F.	"	K.	56 "	" "
		3660	"	"	"	K.	56 "	" "
		3655	"	R.H.	"	K.	56 "	" "
		3656	"	"	"	K.	56 "	" "
April 22, 1909 [63 days after inoculation].	—	3728	Intrap.	L.F.	10·0 cc.	K.	51 days	No tuberculosis.
		3729	"	"	"	K.	51 "	" "
		3724	"	R.F.	"	K.	51 "	" "
		3725	"	"	"	K.	51 "	" "
		3726	"	R.H.	"	K.	51 "	" "
		3727	"	"	"	K.	51 "	" "
May 6, 1909 [77 days after inoculation].	L.F. 820·0 cc.	3755	Intrap.	L.F.	10·0 cc.	K.	71 days	No tuberculosis.
		3756	"	"	"	K.	71 "	" "
	R.F. 530·0 cc.	3757	"	R.F.	"	D.	12 "	No tuberculosis. (Death from pseudo-tuberculosis.)
		3758	"	"	"	K.	71 "	No tuberculosis.
	R.H. 1150·0 cc.	3753	"	R.H.	"	K.	71 "	" "
		3754	"	"	"	K.	71 "	" "
June 3, 1909 [105 days after inoculation].	L.F. 550·0 cc.	3773	Intrap.	L.F.	10·0 cc.	K.	56 days	No tuberculosis.
		3774	"	"	"	K.	56 "	" "
	R.F. 370·0 cc.	3775	"	R.F.	"	K.	56 "	" "
		3776	"	"	"	K.	56 "	" "
	R.H. 990·0 cc.	3771	"	R.H.	"	K.	56 "	" "
		3772	"	"		K	56 "	" "

Guinea-pigs inoculated with the Milk of Cow 565—*continued.*

Date.	Total yield of milk in 24 hours.	No. of Guinea-pig.	Mode of Inoculation.	Quarter of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
July 1, 1909 [133 days after inoculation].	L.F. 367·0 cc.	3791	Intrap.	L.F.	10·0 cc.	K.	53 days	No tuberculosis.
		3792	„	„	„	K.	53 „	„ „
	R.F. 231·0 cc.	3795	„	R.F.	„	K.	53 „	„ „
		3796	„	„	„	K.	53 „	„ „
	R.H. 740·0 cc.	3793	„	R.H.	„	K.	53 „	„ „
		3794	„	„	„	K.	53 „	„ „
August 5, 1909 [168 days after inoculation, and 15 days after giving birth to a dead foetus].	—	3822	Intrap.	L.F.	10·0 cc.	K.	60 days	No tuberculosis.
		3823	„	„	„	K.	60 „	„ „
		3826	„	R.F.	„	K.	60 „	„ „
		3827	„	„	„	K.	60 „	„ „
		3824	„	R.H.	„	K.	60 „	„ „
		3825	„	„	„	D.	4 „	„ „
August 12, 1909 [175 days after inoculation].	L.F. 2050·0 cc.	3842	Intrap.	L.F.	10·0 cc.	K.	53 days	No tuberculosis.
		3843	„	„	„	K.	53 „	„ „
	R.F. 2340·0 cc.	3840	„	R.F.	„	K.	53 „	„ „
		3841	„	„	„	K.	53 „	„ „
	R.H. 2440·0 cc.	3844	„	R.H.	„	K.	53 „	General tuberculosis apparently of spontaneous origin.
		3845	„	„	„	K.	53 „	No tuberculosis.
August 14, 1909 [177 days after inoculation].	L.F. 1670·0 cc.	3850	Intrap.	L.F.	10·0 cc.	K.	52 days	No tuberculosis.
		3851	„	„	„	K.	52 „	„ „
	R.F. 1900·0 cc.	3848	„	R.F.	„	K.	52 „	„ „
		3849	„	„	„	K.	52 „	„ „
	R.H. 1520·0 cc.	3846	„	R.H.	„	K.	52 „	„ „
		3847	„	„	„	K.	52 „	„ „
August 16, 1909 [179 days after inoculation].	L.F. 2200·0 cc.	3852	Intrap.	L.F.	10·0 cc.	K.	52 days	No tuberculosis.
		3853	„	„	„	K.	52 „	„ „
	R.F. 2220·0 cc.	3856	„	R.F.	„	K.	52 „	„ „
		3857	„	„	„	K.	52 „	„ „
	R.H. 2170·0 cc.	3854	„	R.H.	„	K.	52 „	„ „
		3855	„	„	„	K.	52 „	„ „
August 19, 1909 [182 days after inoculation].	L.F. 1500·0 cc.	3858	Intrap.	L.F.	10·0 cc.	K.	50 days	No tuberculosis.
		3859	„	„	„	K.	50 „	„ „
	R.F. 1580·0 cc.	3862	„	R.F.	„	K.	50 „	„ „
		3863	„	„	„	K.	50 „	„ „
	R.H. 1650·0 cc.	3860	„	R.H.	„	K.	50 „	„ „
		3861	„	„	„	K.	50 „	„ „

PIG 145 (Boar) and PIG 147 (Sow).

(Each 11 weeks old.)

Fed daily for seven days from February 20 to 26, 1909, with the milk of Cow 565.

Dose—All the milk drawn from the cow during the seven days commencing February 20, 1909, was given to the pigs.

Killed when in good health—June 3, 1909. [97 days after the commencement of the experiment.]

Weights.

	Pig 145. cwts.	qrs.	lbs.	*Pig 147.* qrs.	lbs.
February 20, 1909 ...		1	12	1	7
June 3, 1909 ...	1	0	18	3	26
Total gain of weight—		3	6	2	19

POST-MORTEM EXAMINATIONS.

The carcases were fat.

Pig 145 was healthy throughout.

Pig 147 showed one pinhead-sized calcareous tubercle in the left submaxillary gland (smear, no tubercle bacilli); all the other glands and the organs were healthy.

EXPERIMENT E.

GOAT 79 [Adult Female].

Subcutaneous inoculation of culture derived from the original material of Virus H. 110. "J.B." (*a*) through Guinea-pig 3007.

Dose—50·0 milligrammes.

Date of Inoculation—November 12, 1908.

Killed when apparently in good health—November 21, 1908. [9 days after inoculation.]

Clinical Notes.

Centrifuged deposit of milk from the left quarter was examined microscopically 24 hours after inoculation; no tubercle bacilli were seen.

Centrifuged deposit of milk from the same quarter was examined 48 hours after inoculation with the same result.

On the sixth day after inoculation milk from the left quarter was examined microscopically (only 0·5 cc. was obtained); and on the following day (November 19) a drop of milk from the left quarter was examined; no tubercle bacilli were seen on either occasion.

The goat was now "dry," the left side of the udder having ceased to yield any milk; the right side had ceased to yield three days previously. She was therefore killed, on November 21, 1908, 9 days after inoculation.

Twenty cubic centimetres of saline were injected into each milk sinus of the goat before she was killed, and then as much as possible was withdrawn, 16·0 cc. in the case of the right and 18·0 cc. in that of the left; the fluid was in each case slightly milky. Smear preparations from the fluid showed no tubercle bacilli.

Temperature.

The day after inoculation the temperature was 40·0° C., and the pyrexia continued until the goat was killed on the 9th day; the highest temperature recorded was 40·6° C.

Weights.

	qrs.	lbs.
November 12, 1908	3	26
November 21, 1908	3	20

Loss of weight.—6 lbs.

POST-MORTEM EXAMINATION.

The carcass was in fair condition.

Local Lesion.—In the subcutaneous tissues on the left side of the neck there was a patch about the area of the palm of one's hand and 1 cm. thick, of yellow necrotic breaking-down substance adherent to and infiltrating both skin and muscles.

Left Prescapular Gland.—The left prescapular gland was much enlarged and showed the greater part of its cortex in a state of early caseation.

Right Prescapular Gland.—Normal.

Thorax.

Lungs.—The lungs were crepitant and contained a moderate number of deeply congested tubercles up to 1 mm. in diameter which could be distinctly felt between the finger and the thumb; a few had opaque yellowish centres.

Thoracic Glands.—Normal.

Mamma.—The left side of the mammary gland was larger than the right; the gland tissue and the mucous membrane of the milk sinuses were normal to the naked eye; the milk sinuses and ducts were practically empty.

Other organs and glands were normal to the naked eye.

There were two small foetuses in the uterus.

Microscopical Examinations.

Smears from emulsions of—

Lung.—No tubercle bacilli seen.

Liver.—No tubercle bacilli seen.

Spleen.—No tubercle bacilli seen.

Supramammary Gland.—No tubercle bacilli seen.

GUINEA-PIGS INOCULATED WITH THE BLOOD, AND WITH EMULSIONS OF VARIOUS TISSUES, FROM GOAT 79.

Material Inoculated.	No. of Guinea-pig.	Mode of Inoculation.	Dose.	Killed or Died.	Duration of Life.	Result.
Blood	3376	Intrap.	5·5 cc.	K.	68 days	No tuberculosis.
	3377	Intrap.	5·5 cc.	K.	68 „	No tuberculosis.
Emulsion of lung ...	3378	Intrap.	—	D.	27 days	Moderately severe general tuberculosis.
Emulsion of supra-mammary gland.	3379	Intrap.	—	K.	68 days	General tuberculosis.
Emulsion of liver ...	3380	Intrap.	—	K.	68 „	General tuberculosis.
Emulsion of spleen	3381	Intrap.	—	D.	56 days	Moderately severe general tuberculosis.

GUINEA-PIGS INOCULATED WITH MILK OF GOAT 79.

Date.	Total yield of milk in 24 hours.	No. of Guinea-pig.	Mode of Injection.	Half of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
Nov. 12, 1908 [Before inoculation].		3355	Intrap.	Left	10·0 cc.	K.	205 days	Healthy.
		3356	„	„	10·0 cc.	D.	81 „	No tuberculosis.
		3357	„	Right	10·0 cc. (and a small quantity from Left)	K.	205 „	Healthy.
Nov. 13, 1908 [24 hours after inoculation].	Left half 36·0 cc.	3360	Intrap.	Left	10·0 cc.	K.	55 days	No tuberculosis.
		3361	„	„	10·0 cc.	K.	55 „	„ „
	Right half 16·0 cc.	3358	„	Right	10·0 cc.	K.	55 „	„ „
		3359	„	„	6·0 cc.	K.	55 „	„ „
Nov. 14, 1908 [48 hours after inoculation].	Left half 24·0 cc.	3364	Intrap.	Left	10·0 cc.	K.	54 days	No tuberculosis.
		3365	„	„	10·0 cc.	K.	54 „	„ „
	Right half 9·0 cc.	3362	„	Right	4·5 cc.	K.	54 „	„ „
		3363	„	„	4·5 cc.	K.	54 „	General tuberculosis.
Nov. 15, 1908 [3 days after inoculation].	Left half 10·0 cc.	3367	Intrap.	Left	10·0 cc.	D.	26 days	T. of omentum and portal gland. Death from other causes.
	Right half 3·0 cc.	3366	„	Right	3·0 cc.	K.	53 „	Slight general tuberculosis.
Nov. 16, 1908 [4 days after inoculation].	Left half 3·0 cc.	3369	Intrap.	Left	3·0 cc.	K.	57 days	No tuberculosis.
	Right half 3 drops.	3368	„	Right	About 3 drops	D.	24 „	One tubercle in omentum. Death from other causes.
Nov. 17, 1908	Left half 0·5 cc.	3370	Intrap.	Left	About 0·5 cc.	K.	71 days	No tuberculosis.
Nov. 18, 1908	Left half 0·5 cc.	3371	Intrap.	Left	0·5 cc.	K.	70 days	No tuberculosis.

Guinea-pigs inoculated with the fluid obtained after flushing the two sides of the udder with normal saline on November 21, 1908 (see clinical history).

Date.	No. of Guinea-pig.	Mode of Injection.	Half of Udder.	Dose.	Killed or Died.	Duration of Life.	Result.
Nov. 21, 1908 [9 days after inoculation].	3374	Intrap.	Left	10·0 cc. of fluid.	K.	67 days	No tuberculosis.
	3375	,,	,,	8·0 cc.	K.	67 ,,	,, ,,
	3372	,,	Right	10·0 cc. of fluid.	K.	67 ,,	General tuberculosis.
	3373	,,	,,	6·0 cc.	K.	67 ,,	,, ,,

EXPERIMENT F.

GOAT 55 [Adult Female].

Subcutaneous inoculation of culture derived from a human mesenteric gland (Virus H 90. "I.P.").

Dose—50·0 milligrammes.

Date of Inoculation—November 14, 1907.

Killed when in good health—February 25, 1908. [103 days after inoculation.]

Clinical Notes.

Three weeks after inoculation there was an elongated raised local tumour measuring 11 by about 6 cm., the margins being rather ill-defined, soft, and fluctuating. A small opening had appeared at the inferior margin of the tumour a few days previously, from which a small quantity of pus was discharged. The discharge continued intermittently and the tumour decreased considerably in size; finally the discharge ceased and the opening healed, leaving a linear scar.

The condition of the goat at the close of the period of high temperature (*see* below) was fairly good; it had not shown any symptoms of illness, and it quickly improved in condition and remained well subsequently.

Centrifuged deposits of milk from the left and right halves of the udder were examined microscopically twenty-four hours after inoculation. No tubercle bacilli were seen in that from the left half, some (?) tubercle bacilli were seen in that from the right.

On the third and fourth days after inoculation centrifuged deposits from both halves were again examined, and no tubercle bacilli were found. On the second and fourth days after inoculation the fæces were microscopically examined; no tubercle bacilli were seen, but a few short thick acid-fast bacilli were seen on each occasion. (For milk inoculations *see* table.)

Temperature.

On the second day after inoculation the temperature rose to 40·1° C. and reached a maximum of 40·5° C. on the 11th day; the temperature was raised for a total period of 29 days, after which it was quite normal.

Tuberculin Test.

February 21, 1908. [99 days after inoculation.] Reacted. Rise of temperature, 2·3° C.

Weights.

	qrs.	lbs.
November 14, 1907	3	3
February 25, 1908	3	2

Loss of weight.—1 lb.

POST-MORTEM EXAMINATION.

The goat was in good condition.

Local Lesion.—The skin on the left side of the neck showed a linear scar 7 cm. in length; on section of the skin, through the centre of the scar and at right-angles to it, the subcutaneous tissues were seen to be thickened for a good distance around the scar and beset with softened yellow caseous nodules slightly gritty from calcification, ranging in size from a millet seed to a large pea, the larger nodules being situated chiefly towards the periphery of the thickened patch.

Left Prescapular Gland.—The left prescapular gland measured 5 by 2·5 by 1·7 cm.; it contained two large nodules, one 2 cm. in diameter, the other rather less, composed of soft caseous substance gritty around the margins.

Right Prescapular Gland.—The right prescapular gland measured 4·3 by 2·5 by 1·3 cm.; on section it showed a softened caseous nodule 1 cm. in diameter and about half-a-dozen miliary caseous tubercles.

Thorax.

Pleura.—Normal.

Lungs.—The lungs were pink and crepitant and collapsed normally; they showed under the pleura as well as in the depth fairly numerous evenly distributed grey fibrous tubercles, the largest 1 mm. in diameter; some were slightly opaque in the centre. In the caudal lobes near the surface were many firm slightly raised patches, not so pink as the surrounding lung and composed apparently of aggregations of grey foci (pieces floated in water). They were caused by filariæ, the embryos of which could be demonstrated in large numbers in a smear preparation.

Bronchial and Mediastinal Glands.—Normal.

Heart.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—Normal.

Liver.—A few yellow and greenish-yellow foci of a doubtful nature were seen in the substance.

Portal Glands.—Normal.

Kidneys.—In the cortex of one there was a pale grey streak; in that of the other just under the capsule there was a grey nodule (2 mm. in diameter). This on section penetrated the whole thickness of the cortex and had a yellow caseous centre and grey margins.

Suprarenal Bodies.—Normal.

Renal, Lumbar and Iliac Glands.—Normal.

Genito-Urinary System.

Mammary Gland.—The halves were cut up into thin longitudinal strips. On passing those of the left between the finger and thumb, a number of hard bodies were felt; these on section were tubercles about the size of millet seeds with fibrous margins and yellow caseous gritty centres which were readily shelled out; one of the tubercles projected into one of the ducts; besides these tubercles there were two hard nodules, the largest 1 cm. in diameter, which were composed of denser tissue than the surrounding gland tissue and contained yellow caseous foci; no tubercles were seen in the right gland, but there was a small firm patch beset with caseous points. The milk sinuses and ducts did not contain any milk and the mucous membrane was normal.

Supramammary Lymphatic Glands.—Normal.

Alimentary Tract.

Tongue, Pharynx, Tonsils.—Normal.

Submaxillary and Retro-pharyngeal Glands.—Normal.

Intestines.—Normal.

Mesenteric Glands.—Most of the mesenteric glands contained a number of soft yellow gritty tubercles arranged around the cortex, and in places aggregated together to form irregular caseo-calcareous patches.

Peripheral Lymphatic Glands.—Normal.

Microscopical Examination.

Tubercle from Kidney.—One tubercle bacillus seen.

Focus from Liver.—No tubercle bacilli.

Firm Patch from Lung.—No tubercle bacilli. Numerous embryos.

Tubercle from Lung.—No tubercle bacilli seen.

Emulsion of Prescapular Gland.—Tubercle bacilli in moderate numbers.

Tubercle from Mesenteric Gland.—One tubercle bacillus seen after prolonged search.

Mammary Gland.—	*The yellow centre of a tubercle.* No tubercle bacilli seen.
	Three foci from one of the nodules. One tubercle bacillus seen.

Animals Inoculated.

Rabbits 1741 and 1742 were inoculated subcutaneously with an emulsion made from the left prescapular gland. Both died of general tuberculosis, the former in 145, the latter in 157 days.

Guinea-pig 2980 was inoculated intraperitoneally with an emulsion made from the spleen. It was healthy when killed after 94 days.

GUINEA-PIGS INOCULATED WITH THE MILK OF GOAT 55.

Date.	Total yield of Milk in 24 hours.	No. of Guinea-pig.	Mode of Injection.	Half of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
Nov. 13, 1907 [before inoculation].		2721	Intrap.	Right	10·0 cc.	K.	57 days	Healthy.
		2722	,,	Left	10·0 cc.	,,	,,	,,
		2723	,,	Right and Left (mixed).	10·0 cc.	,,	,,	,,
Nov. 15, 1907 [24 hours after inoculation].	130·0 cc. both halves.	2730	Intrap.	Left	10·0 cc.	K.	60 days	Early general tuberculosis.
		2731	,,	,,	20·0 cc.	K.	60 days	Early general tuberculosis.
		2732	,,	Right	10·0 cc.	D.	5 days	Pseudo-tuberculosis.
		2733	,,	,,	20·0 cc.	K.	60 days	Very slight general tuberculosis.
Nov. 16, 1907 [2 days after inoculation].	28·0 cc. left half.	2736	Intrap.	Left	Centrifuged deposit of 10·0 cc.	K.	53 days	General tuberculosis.
		2737	,,	,,	Centrifuged deposit of 18·0 cc.	K.	53 days	Early general tuberculosis.
	65·0 cc. right half.	2738	,,	Right	Centrifuged deposit of 18·0 cc. plus 10·0 cc. of uncentrifuged milk.	D.	1 day	Death from injury.
		2739	,,	,,	Centrifuged deposit of 27·0 cc. plus 10·0 cc. of uncentrifuged milk.	K.	53 days	No tuberculosis.
Nov. 17, 1907 [3 days after inoculation].	95·0 cc. both halves.	2744	Intrap.	Left	Centrifuged deposit of 30·0 cc.	K.	53 days	Early general tuberculosis.
		2745	,,	Right	Centrifuged deposit of 65·0 cc.	K.	53 days	Slight general tuberculosis.

GUINEA-PIGS INOCULATED WITH THE MILK OF GOAT 55—*continued.*

Date.	Total yield of Milk in 24 hours.	No. of Guinea-pig.	Mode of Injection.	Half of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
Nov. 18, 1907 [4 days after inoculation].	38·0 cc. left half.	2748	Intrap.	Left	Centrifuged deposit of 38·0 cc.	K.	52 days	Early slight general tuberculosis.
	68·0 cc. right half.	2749	,,	Right	Centrifuged deposit of 68·0 cc.	K.	52 days	No tuberculosis.
Nov. 19, 1907 [5 days after inoculation].	34·0 cc. left half.	2752	Intrap.	Left	Centrifuged deposit of 30·0 cc. plus 4·0 cc. of uncentrifuged milk.	K.	69 days	General tuberculosis of moderate severity.
	74·0 cc. right half.	2753	,,	Right	Centrifuged deposit of 70·0 cc. plus 4·0 cc. of uncentrifuged milk.	K.	69 days	Slight general tuberculosis.
Nov. 20, 1907 [6 days after inoculation].	47·0 cc. left half.	2758	Intrap.	Left	10·0 cc.	D.	72 days	Severe general tuberculosis.
		2759	,,	,,	10·0 cc.	K.	73 days	General tuberculosis of moderate severity.
	77·0 cc. right half.	2760	,,	Right	10·0 cc.	K.	79 days	No tuberculosis.
		2761	,,	,,	10·0 cc.	K.	79 days	No tuberculosis.
Nov. 21, 1907 [7 days after inoculation].	28·0 cc. left half.	2764	Intrap.	Left	10·0 cc.	D.	73 days	General tuberculosis of moderate severity.
		2765	,,	,,	Centrifuged deposit of 18·0 cc. emulsified in saline.	D.	86 days	General tuberculosis.
	45·0 cc. right half.	2766	,,	Right	10·0 cc.	D.	12 days	Slight pseudo-tuberculosis. No sign of tuberculosis.
		2767	,,	,,	Centrifuged deposit of 35·0 cc. emulsified in saline.	K.	130 days	Slight general tuberculosis.
Nov. 22. 1907 [8 days after inoculation].	20·0 cc. left half.	2770	Intrap.	Left	10·0 cc.	K.	112 days	General tuberculosis, not severe.
		2771	,,	,,	10·0 cc.	D.	102 days	General tuberculosis.
	60·0 cc. right half.	2772	,,	Right	10·0 cc.	K.	112 days	General tuberculosis, not severe.
		2773	,,	,,	10·0 cc.	K.	112 days	No tuberculosis.
Nov. 28, 1907 [14 days after inoculation].	40·0 cc. left half.	2789	Intrap.	Left	10·0 cc.	D.	99 days	General tuberculosis.
		2790	,,	,,	10·0 cc.	D.	104 days	General tuberculosis.
	117·0 cc. right half.	2791	,,	Right	10·0 cc.	D.	88 days	Severe general tuberculosis.
		2792	,,	,,	10·0 cc.	K.	101 days	Chronic general tuberculosis.
Dec. 5. 1907 [21 days after inoculation].	67·0 cc. left half.	2831	Intrap.	Left	6–7·0 cc.	D.	95 days	Severe general tuberculosis.
	40·0 cc. right half	2832	,,	Right	Centrifuged deposit of 40·0 cc.	K.	116 days	General tuberculosis.
Jan. 28, 1908 [75 days after inoculation].	About 0·5 cc. left half.	2920	Intrap.	Left	About 0·5 cc.	K.	62 days	Early slight general tuberculosis.
	About 1·5 cc. right half.	2921	,,	Right	About 1·5 cc.	K.	58 days	Chronic general tuberculosis.

GUINEA-PIGS INOCULATED WITH THE FAECES OF GOAT 55.

Date.	No. of Guinea-pig.	Mode of Injection.	Dose of Faeces.	Killed or Died.	Duration of Life.	Result.
Nov. 16, 1907 [2 days after inoculation].	2734	Intrap.	1·0 cc. Emulsion of Faeces—1 in 20 dilution.	D.	6 days	The cause of death was not apparent.
	2735	,,	1·0 cc.	D.	6 days	
Nov. 18, 1907 [4 days after inoculation].	2746	Intrap.	1·0 cc. Do. do.	D.	7 days	The cause of death was not apparent.
	2747	,,	1·0 cc.	D.	2 days	An acute infection.
Nov. 21, 1907 [7 days after inoculation].	2768	Intrap.	1·0 cc. Do. do.	K.	130 days	No tuberculosis.
	2769	,,	1·0 cc.	K.	130 days	,, ,,
Nov. 23, 1907 [9 days after inoculation].	2774	Intrap.	1·0 cc. Do. do.	K.	111 days	No tuberculosis.
	2775	,,	1·0 cc.	K.	111 days	,, ,,

RABBITS INOCULATED WITH CULTURE DERIVED FROM THE MILK OF GOAT 55 THROUGH GUINEA-PIG 2791.

Date of Inoculation.	Immediate Source of Culture.	Dose in Milli-grammes.	No. of Rabbit.	Mode of Inocula-tion.	Killed or Died.	Duration of Life.	Result.
Aug. 14, 1908.	The culture was obtained from G.P. 2791, inoculated on Nov. 28, 1907, with 10·0 cc. of milk from the right half of the udder. The 7th generation 11 days old was used for inoculation.	1·0 mg.	1967	Intrav.	K.	167 days	Tuberculosis of lungs and kidneys.
		0·1 mg.	1968	Intrav.	K.	167 ,,	Very slight tuberculosis of lungs and kidneys.
		0·01 mg.	1969	Intrav.	K.	167 ,,	Very slight tuberculosis of lungs and kidneys.
		50·0 mg.	1970	Subcut.	K.	167 ,,	Local lesion, a moderate number of caseating nodules in lungs, and one minute grey tubercle in one kidney.

EXPERIMENT G.

GOAT 59 [Adult Female].

Subcutaneous inoculation of culture derived from a tuberculous lung (Virus H 79. "J.N.").

Dose—100·0 milligrammes.

Date of Inoculation—November 28, 1907

Killed when in good health—March 13, 1908. [106 days after inoculation.]

Clinical Notes.

At the close of the first week after inoculation there was a large somewhat flattened and firm tumour measuring 9 by 5 cm. at the seat of inoculation with rather ill-defined margins; the skin over it was hot and slightly tender. The adjacent prescapular gland was enlarged, measuring 5 cm. in diameter.

For the previous two or three days the appetite had not been so good and the goat was losing flesh; the milk was diminished in amount. The respiration was not increased.

The tumour subsequently became soft and fluctuating, and then opened and discharged. The goat quickly improved in general health, and was quite well during the last two months of the experiment.

Temperature.

The temperature rose to 40·6° C. on the 5th day after inoculation; it was raised and irregular for a period of six weeks, the temperature varying for the most part between 39·0° and 40·0° C. Subsequently it remained normal.

Tuberculin Tests.

February 21, 1908. [85 days after inoculation.] 1·0 cc. tuberculin (human). Reacted. Rise of temperature, 1·8° C.

March 4, 1908. [97 days after inoculation.] 4·0 cc. tuberculin (avian). Reacted. Rise of temperature, 1·8° C.

Weights.

	qrs.	lbs.
November 28, 1907	3	0
March 13, 1908	3	2

Total gain of weight.—2 lbs.

POST-MORTEM EXAMINATION.

The carcass was in good condition.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a scar measuring 5 by 1·5 cm. in area; on section through it the subcutaneous tissues under and for a short distance around it were slightly thickened and beset with yellow caseo-calcareous tubercles varying in size from a pin's head to a hemp seed.

Left Prescapular Gland.—The left prescapular gland was enlarged, measuring 3 by 2 by 1·5 cm.; the major part of its substance was occupied by an oval firm caseous mass slightly gritty from calcification.

Right Prescapular Gland (3 by 1·7 by 0·8 cm.).—Normal on section.

Prepectoral, Cervical, and Axillary Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—The lungs were pink and collapsed normally; on the dorsal surface of each caudal lobe there were several firm slightly projecting greyish patches which extended into the lung substance for some distance (similar to those in Goat 55); elsewhere the lung parenchyma showed fairly numerous more or less discrete translucent grey tubercles varying up to about 1·5 mm. in diameter, several of which showed in the centre a minute soft whitish focus.

The patches in the caudal lobes were undoubtedly parasitic in origin; the separate tubercles were probably also caused by parasites, though these were not detected in smear preparations.

Bronchial and Mediastinal Glands.—Normal.

Heart.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—Normal.

Liver.—One miliary tubercle with a minute opaque white centre was seen in the substance of the liver just under the capsule.

Portal Glands.—Normal.

Kidneys.—The kidneys showed on the surface a number of pale grey spots of various sizes, these penetrated the cortex as radial streaks; the majority were obviously not tuberculous, but a few showed a whitish focus or two, and without microscopical examination a decision as to the nature of these could not have been made.

Suprarenal Bodies.—Normal.

Iliac Glands.—One of the left iliac glands showed in the cortex an irregular caseous gritty patch 5 mm. in diameter.

Renal and Lumbar Glands.—Normal.

Alimentary Tract.

Tongue, Pharynx, Palate, Tonsils.—Normal.

Submaxillary Glands.—The left contained a caseous gritty focus; the right was normal.

Intestines.—Normal.

Mesenteric Glands.—All the mesenteric glands were tuberculous; the large one at the posterior end showed several patches composed of a coarse yellow caseous slightly gritty network; the rest of the glands contained scattered discrete irregular caseous foci and streaks, some just perceptibly gritty.

Ileo-Colic Glands.—All the ileo-colic glands contained discrete irregular caseous tubercles.

The tubercles in these and the mesenteric glands were situated at the outer margin of the cortex just under the capsule.

Genito-Urinary System.

Mammary Gland.—The gland was cut up into thin longitudinal strips, but no tubercles were seen. There was no milk in the sinuses or ducts.

Supramammary lymphatic Glands.—Normal.

Peripheral Lymphatic Glands.

Precrural, Popliteal, Gluteal, Ischiatic.—Normal.

On the right side of the neck at the site of inoculation of tuberculin (*see* above) there was a small firm swelling; on section the swelling was caused by a layer of fibrous tissue, mottled with hæmorrhages, between the muscles, which were oedematous.

Microscopical Examination.

(Smears from :—)

Submaxillary Gland (caseous focus).—No tubercle bacilli seen.

Mesenteric Gland (caseous patch).—No tubercle bacilli seen.

Kidney (whitish focus).—Tubercle bacilli, few seen.

Lung (firm patch in caudal lobe).—Numerous embryos of the filiariæ.

Lung (soft central foci of small tubercles, 2 smears).—No tubercle bacilli seen.

Tuberculin Swelling.—Tubercle bacilli moderately numerous. (These bacilli were no doubt inoculated with the tuberculin; *see* result of guinea-pig inoculation with an emulsion of the swelling.)

Animals Inoculated.

Guinea-pig 3000 was inoculated intraperitoneally with an emulsion of the tuberculin swelling; and Guinea-pig 3001 intraperitoneally with an emulsion of spleen. The former died in 54 days, the latter in 49 days; neither showed any sign of tuberculosis.

GUINEA-PIGS INOCULATED WITH THE MILK OF GOAT 59.

Date.	Total yield of milk in 24 hours.	No. of Guinea-pig.	Mode of Injection.	Half of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
Nov. 28, 1907 [before inoculation].		2793	Intrap.	Left	10·0 cc.	K.	95 days	Healthy.
		2794	,,	Right	10·0 cc.	,,	,,	Healthy.
		2795	,,	Left and Right (mixed).	10·0 cc.	,,	,,	Healthy.
Nov. 29, 1907 [24 hours after inoculation].	Left half 202·0 cc.	2796	Intrap.	Left	10·0 cc.	K.	55 days	General tuberculosis.
		2797	,,	,,	Centrifuged deposit of 96·0 cc.	,,	,,	General tuberculosis.
		2799	,,	,,	Do. do.	,,	,,	General tuberculosis.
	Right half 202·0 cc.	2798	,,	Right	10·0 cc.	,,	,,	Early general tuberculosis.
		2800	,,	,,	Centrifuged deposit of 96·0 cc.	,,	,,	General tuberculosis.
		2801	,,	,,	Do. do.	,,	,,	General tuberculosis.
Nov. 30, 1907 [2 days after inoculation].	Left half 114·0 cc.	2807	Intrap.	Left	10·0 cc.	D.	75 days	Severe general tuberculosis.
		2808	Intrap. and partly Subcut.	,,	10·0 cc.	D.	75 days	Severe general tuberculosis.
	Right half 104·0 cc.	2809	Intrap.	Right	10·0 cc.	D.	87 days	General tuberculosis
		2810	,,	,,	10·0 cc.	D.	80 days	General tuberculosis
Dec. 2, 1907 [4 days after inoculation].	Left half 70·0 cc.	2811	Intrap.	Left	Centrifuged deposit of 35·0 cc.	D.	109 days	General tuberculosis
		2812	,,	,,	Do. do.	K.	113 days	General tuberculosis.
	Right half 74·0 cc.	2813	,,	Right	Centrifuged deposit of 37·0 cc.	D.	89 days	General tuberculosis.
		2814	,,	,,	Do. do.	D.	90 days	General tuberculosis.
Dec. 3, 1907 [5 days after inoculation].	Left half 75·0 cc.	2821	Intrap.	Left	10·0 cc.	D.	58 days	General tuberculosis.
	Right half 50·0 cc.	2822	,,	Right	10·0 cc.	K.	112 days	General tuberculosis.
Dec. 4, 1907 [6 days after inoculation].	Left half 38·0 cc.	2827	Intrap.	Left	Centrifuged deposit of 19·0 cc.	D.	109 days	General tuberculosis.
		2828	,,	,,	Do. do.	D.	97 days	Severe general tuberculosis.
	Right half 40·0 cc.	2829	,,	Right	Centrifugal deposit of 20·0 cc.	D.	73 days	General tuberculosis.
		2830	,,	,,	Do. do.	D.	72 days	General tuberculosis not very severe

EXPERIMENT H.

GOAT 69 [Adult Female].

Subcutaneous inoculation of culture derived from cerebro-spinal fluid through Guinea-pig 2878 (Virus H 98. "B.R.")

Dose—10·0 milligrammes.

Date of Inoculation—June 3, 1908.

Killed when in good health—September 25, 1908. [114 days after inoculation.]

Clinical Notes.

On June 5, two days after inoculation, the centrifuged deposit of milk from the right and the left halves of the udder was examined microscopically. No tubercle bacilli were seen in that from the left half, one bacillus stained red was found in that from the right.

On June 17, the centrifuged deposit of milk was again examined; no tubercle bacilli were seen in that from the left half, five long tubercle bacilli were seen in that from the right.

On July 15 (42 days after inoculation) before withdrawing the milk for the inoculation of guinea-pigs, the udder was noticed to be enlarged : on palpation the right side was found to be uniformly enlarged, knotty, and indurated ; the left side was not obviously enlarged but contained some hard nodules just above the teat. An enlarged supramammary lymphatic gland was felt on the right side. The milk was much diminished in amount (only about 5 cc. being obtained from the right half and 14 cc. from the left half), but showed no alteration in quality.

On July 15 culture tubes were sown from the milk of each half. and pure cultures of tubercle bacilli were obtained, the colonies being more numerous on the tube sown with milk from the right side than on that sown with milk from the left side.

The general health of the animal was good.

On July 31 a few drops of milk were obtained from the right side of the mamma, and about 1·0 cc. from the left. No tubercle bacilli were found in smear preparations made from either of the samples.

On September 24 both sides of the udder were still indurated, but had decreased in size.

The goat was in good health when killed on September 25.

Temperature.

On the 45th day after inoculation the temperature rose to 39·5° C. and reached a maximum of 39·8° C. on the 50th day ; it was raised during 10 days in all (July 18–28). With this exception, the temperature remained approximately normal, though somewhat irregular, during the experiment.

Tuberculin Test.

August 18, 1908. [76 days after inoculation.] Dose, 1·0 cc. Reacted. Rise, 1·8° C.

Weights.

	qrs.	lbs.
June 3, 1908...	2	22
September 25, 1908	2	21

POST-MORTEM EXAMINATION.

The carcass was in good condition.

Local Lesion.—In the subcutaneous tissues at the seat of inoculation on the left side of the neck there was a softened caseous encapsuled mass rather less than a pigeon's egg in size ; the capsule was adherent to the skin but not to the muscles ; it was about 1 mm. thick and lined internally with granulation tissue.

Left Prescapular Gland.—The left prescapular gland was the same size as the right, and was normal on section.

Right Prescapular Gland.—Normal.

Prepectoral and Axillary Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—On the dorsal surface of each caudal lobe there were many irregular firm reddish patches which on section were found to extend a short distance into the substance of the lung ; the patches were due to parasites, numerous embryos of the filaria being found in a smear preparation ; no tubercles were seen in the lung.

Bronchial and Mediastinal Gland.—Normal.

Heart.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen, Liver, Kidneys, and Suprarenal Bodies.—Normal.

Portal, Coeliac, Lumbar, and Iliac Glands.—Normal.

Alimentary Tract.

Tongue, Pharynx, Palate, Tonsils.—Normal.

Submaxillary and Retro-pharyngeal Glands.—Normal.

Intestines and Mesenteric Glands.—Normal.

Mammary Gland.—The mammary tissue felt indurated and nodular, particularly in the posterior parts ; the right half of the gland was larger than the left, which was on the whole probably not much larger than it should be.

On removal the upper surfaces showed several irregular spherical nodules which were fibrous-walled cysts containing a substance resembling cream cheese ; at the outer margin of each half of the mamma there was a thin-walled cyst containing about a cubic centimetre or more of milky-white fluid.

On section the tissue of the right half of the mamma was very tough and fibrous and beset with shotty tubercles from 1· to 1·5 mm. in diameter which stood up from the cut surface ; these tubercles had fibrous margins and yellow centres which in the majority of cases were calcareous or caseo-calcareous and in a few caseous and softened ; towards the posterior part there was a yellow caseo-calcareous nodule the size of a wheat-grain. The left half of the mamma was similar to the right, but the tubercles were not so numerous.

The milk sinuses contained a small quantity of turbid or pale milky watery fluid ; some of this was pipetted from each sinus through the teat before the mamma was cut into and cultures sown ; the mucous membrane of the sinuses was normal.

Supramammary Lymphatic Glands. — Both supramammary lymphatic glands were enlarged, the left only slightly, the right was about twice the size of the left ; on section the tissue of both was oedematous, but there was no sign of tuberculosis.

Various Lymphatic Glands.

Precrural, Popliteal, Gluteal, Ischiatic, Cervical.—Normal.

Microscopical Examination.

Smear from Reddish Patch in Lung.—No tubercle bacilli. Numerous embryos of the filaria.

Smear from Popliteal Gland.—No tubercle bacilli.

Smear from Distended Alveolus in Left Mamma.—No tubercle bacilli seen.

Smear from Distended Alveolus in Right Mamma.—No tubercle bacilli seen.

Smear from Caseo-calcareous Nodule in Right Mamma.—No tubercle bacilli seen. A few diplobacilli.

Smear from Several Miliary Tubercles from Right Mamma.—Three tubercle bacilli seen.

Milky fluid from Left Sinus.—No tubercle bacilli seen

Milky fluid from Right Sinus.—One (?) tubercle bacillus seen.

Animal Inoculated.

Guinea-pig 3287 was inoculated intraperitoneally with an emulsion of the right supramammary gland.

It was killed after 49 days and showed slight general tuberculosis.

GUINEA-PIGS INOCULATED WITH THE MILK OF GOAT 69.

Date.	Total yield of Milk in 24 hours.	No. of Guinea-pig.	Mode of Injection.	Half of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
June 3, 1908 [before inoculation].		3093	Intrap.	Left	10·0 cc.	K.	83 days	Healthy.
		3094	,,	Right	10·0 cc.	K.	83 ,,	,,
		3095	,,	Left and Right.	About 9·0 cc.	K.	83 ,,	,,
June 4, 1908 [24 hours after inoculation].	Left half 70·0 cc.	3096	Intrap.	Left	20·0 cc.	K.	37 days	No tuberculosis.
		3097	,,	,,	10·0 cc.	K.	70 ,,	,, ,,
	Right half 50·0 cc.	3098	,,	Right	20·0 cc.	K.	37 ,,	,, ,,
		3099	,,	,,	10·0 cc.	K.	70 ,,	,, ,,
June 5, 1908 [48 hours after inoculation].	Left half 150·0 cc.	3100	Intrap.	Left	Centrifuged deposit of 30·0 cc. plus 10·0 cc. of uncentrifuged milk.	K.	70 days	No. tuberculosis.
		3101	,,	,,		K.	70 ,,	,, ,,
	Right half 153·0 cc.	3102	,,	Right	Centrifuged deposit of 30·0 cc. plus 10·0 cc. of uncentrifuged milk.	K.	70 ,,	,, ,,
		3103	,,	,,		K.	70 ,,	,, ,,
June 6, 1908 [3 days after inoculation].	Left half 77·0 cc.	3105	Intrap.	Left	10·0 cc.	K.	72 days	No tuberculosis.
		3106	,,	,,	10·0 cc.	K.	72 ,,	,, ,,
	Right half 100·0 cc.	3107	,,	Right	10·0 cc.	K.	72 ,,	, ,,
		3108	,,	,,	10·0 cc.	K.	72 ,,	,, ,,
June 8, 1908 [5 days after inoculation].	Left half 34·0 cc.	3109	Intrap.	Left	10·0 cc.	K.	70 days	No tuberculosis.
		3110	,,	,,	10·0 cc.	K.	70 ,,	,, ,,
	Right half 104·0 cc.	3111	,,	Right	10·0 cc.	K.	70 ,,	,, ,,
		3112	,,	,,	10·0 cc.	K.	70 ,,	,, ,,
June 10, 1908 [7 days after inoculation].	Left half 62·0 cc.	3113	Intrap.	Left	10·0 cc.	K.	69 days	No tuberculosis.
		3114	,,	,,	10·0 cc.	K.	69 ,,	,, ,,
	Right half 157·0 cc.	3115	,,	Right	10·0 cc.	K.	69 ,,	,, ,,
		3116	,,	,,	10·0 cc.	K.	69 ,,	,, ,,
June 17, 1908 [14 days after inoculation].	Left half 60·0 cc.	3129	Intrap.	Left	Centrifuged deposit of 30·0 cc. each.	K.	78 days	Chronic general tuberculosis, not severe.
		3130	,,	,,		K.	78 ,,	No tuberculosis.
	Right half 60·0 cc.	3131	,,	Right	Centrifuged deposit of 30·0 cc. each.	K.	78 ,,	Chronic general tuberculosis.
		3132	,,	,,		K.	78 ,,	Chronic general tuberculosis, not severe.
June 24, 1908 [21 days after inoculation].	Left half 45·0 cc.	3133	Intrap.	Left	10·0 cc.	K.	84 days	Chronic general tuberculosis.
		3134	,,	,,	10·0 cc.	K.	84 ,,	Chronic general tuberculosis.
	Right half 60·0 cc.	3135	,,	Right	10·0 cc.	K.	84 ,,	Chronic general tuberculosis.
		3136	,,	,,	10 0 cc.	K.	84 ,,	Chronic general tuberculosis.
July 1, 1908 [28 days after inoculation].	Left half 89·0 cc.	3137	Intrap.	Left	10·0 cc.	D.	64 days	Severe general tuberculosis.
		3138	,,	,,	10·0 cc.	K.	77 ,,	Chronic general tuberculosis.
	Right half 86·0 cc.	3139	,,	Right	10·0 cc.	D.	75 ,,	General tuberculosis.
		3140	,,	,,	10·0 cc.	K.	77 ,,	Chronic general tuberculosis.
July 17, 1908 [44 days after inoculation].	Left half 14·0 cc.	3155	Intrap.	Left	About 7·0 cc.	D.	35 days	General tuberculosis.
		3156	,,	,,	,, ,,	D.	19 ,,	General tuberculosis.
	Right half 5·0 cc.	3153	,,	Right	About 2·5 cc.	D.	22 ,,	General tuberculosis.
		3154	,,	,,	,, ,,	K.	71 ,,	General tuberculosis.

EXPERIMENT I.

GOAT 61 [Adult Female].

Subcutaneous inoculation of culture derived from the original material of Virus H. 109 "M.W." (lupus), through Guinea-pig 3002.

Dose—1·0 milligramme.

Date of Inoculation—July 27, 1908.

Killed when in good health—February 9, 1909. [197 days after inoculation.]

Clinical Notes.

The goat remained well after the inoculation. A small elongated tumour developed at the seat of inoculation on the left side of the neck, which afterwards disappeared, and the adjacent prescapular gland was slightly enlarged for a few weeks.

The milk was inoculated into guinea-pigs at intervals during the experiment (*see* table). Centrifuged deposit from the milk of each side of the udder was examined microscopically on two occasions, August 4 and October 7 ; no tubercle bacilli were seen.

On the latter date cultures were attempted, two egg tubes being sown with the centrifuged deposit of the milk from each side of the udder ; all the tubes remained sterile.

Nothing abnormal was felt in the mammary gland during the experiment.

The goat had given birth to a kid ten weeks before her inoculation ; the kid, No. 71, was permitted to suck its mother from August 13 (17 days after her inoculation) until January 14, 1909.

Temperature.

The temperature was a little raised for a period of 47 days commencing eighteen days after the inoculation ; it averaged about 39·3° C. ; on one occasion 40·0° C. and on another 40·3° C. was recorded. Subsequently the temperature was approximately normal.

Tuberculin Tests

November 4, 1908. [100 days after inoculation.] Dose, 1·0 cc. Reacted. Rise of temperature, 2·1° C.

January 7, 1909. [164 days after inoculation.] Dose, 1·0 cc. Reacted. Rise of temperature, 1·9° C.

Weights.

	qrs.	lbs.
July 27, 1908	3	14
February 9, 1909...	3	17

Total gain of weight.—3 lbs.

POST-MORTEM EXAMINATION.

The carcass was in good condition

Local Lesion.—In the subcutaneous tissues at the seat of inoculation there were two nodules with fibrous walls and creamy caseo-purulent contents ; one was the size of a hemp seed, the other was slightly larger ; in the muscles near these there was a similar nodule the size of a hemp seed.

Left Prescapular Gland.—The left prescapular gland was normal in size and showed no lesions on section.

Lungs.—On the dorsal surface of each caudal lobe in the posterior part there were several firm grey patches and in the rest of the lungs isolated grey nodules caused by filariae. There were no definite tuberculous lesions.

Mesenteric Glands.—In the cortex of one a minute greenish-yellow focus was seen.

Mammary Gland.—Normal.

All other organs and glands were examined and found normal.

GUINEA-PIGS INOCULATED WITH THE MILK OF GOAT 61.

Date.	Total yield of Milk in 24 hours.	No. of Guinea-pig.	Mode of Injection.	Half of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
July 27, 1908 [Before inoculation].	—	3176	Intrap.	Right	10·0 cc.	K.	124 days	Healthy.
		3177	,,	Left	10·0 cc.	K.	124 ,,	,,
		3178	,,	Right and left.	10·0 cc.	K.	124 ,,	,,
July 28, 1908 [24 hours after inoculation].	Both halves 840·0 cc.	3179	Intrap.	Left	10·0 cc. (Milk withdrawn by hand).	K.	66 days	No tuberculosis.
		3180	,,	,,	,,	K.	66 ,,	,, ,,
		3181	,,	Right	,,	K.	66 ,,	,, ,,
		3182	,,	,,	,,	K.	66 ,,	,, ,,

GUINEA-PIGS INOCULATED WITH THE MILK OF GOAT 61—*continued.*

Date.	Total yield of Milk in 24 hours.	No. of Guinea-pig.	Mode of Injection.	Half of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
July 30, 1908 [3 days after inoculation].	—	3187	Intrap.	Left	10·0 cc.	K.	68 days	No tuberculosis.
		3188	„	„	„	K.	68 „	„ „
		3189	„	Right	„	K.	68 „	„ „
		3190	„	„	„	K.	68 „	„ „
August 1, 1908 [5 days after inoculation].	Both halves 390·0 cc.	3195	Intrap.	Left	10·0 cc.	K.	72 days	No tuberculosis.
		3196	„	„	„	K.	72 „	„ „
		3193	„	Right	„	K.	72 „	„ „
		3194	„	„	„	K.	72 „	„ „
August 4, 1908 [8 days after inoculation].	Left half 177·0 cc.	3197	Intrap.	Left	10·0 cc.	K.	69 days	No tuberculosis.
		3198	„	„	„	K.	69 „	„ „
	Right half 170·0 cc.	3199	„	Right	„	K.	69 „	„ „
		3200	„	„	„	K.	69 „	„ „
August 12, 1908 [16 days after inoculation].	Left half 175·0 cc.	3209	Intrap.	Left	10·0 cc.	K.	69 days	No tuberculosis.
		3210	„	„	„	K.	69 „	„ „
	Right half 122·0 cc.	3207	„	Right	„	K.	69 „	„ „
		3208	„	„	„	K.	69 „	„ „
August 26, 1908 [30 days after inoculation].	—	3226	Intrap.	Left	10·0 cc.	K.	62 days	No tuberculosis.
		3227	„	„	„	K.	62 „	„ „
		3228	„	Right	„	K.	62 „	„ „
		3229	„	„	„	K.	62 „	„ „
Sept 16, 1908 [51 days after inoculation].	—	3273	Intrap.	Left	10·0 cc.	K.	69 days	No tuberculosis.
		3274	„	„	„	K.	69 „	„ „
		3271	„	Right	„	K.	69 „	„ „
		3272	„	„	„	K.	69 „	„ „
Sept. 30, 1908 [65 days after inoculation].	—	3307	Intrap.	Left	10·0 cc.	K.	83 days	No tuberculosis.
		3308	„	„	„	K.	83 „	„ „
		3305	„	Right	„	D.	73 „	„ „
		3306	„	„	„	K.	83 „	„ „
Oct. 26, 1908 [91 days after inoculation].	—	3335	Intrap.	Left	10·0 cc.	K.	101 days	No tuberculosis.
		3336	„	„	„	K.	101 „	„ „
		3337	„	Right	„	K.	101 „	„ „
		3338	„	„	„	K.	101 „	„ „
Nov. 5, 1908 [101 days after inoculation].	—	3347	Intrap.	Left	10·0 cc.	K.	93 days	No tuberculosis.
		3348	„	Right	„	K.	93 „	„ „
Nov. 6, 1908 [102 days after inoculation].	—	3353	Intrap.	Left	10·0 cc.	K.	105 days	No tuberculosis.
		3354	„	„	„	K.	105 „	„ „
		3351	„	Right	„	K.	105 „	„ „
		3352	„	„	„	K.	105 „	„ „

GUINEA-PIGS INOCULATED WITH THE MILK OF GOAT 61—*continued.*

Date.	Total yield of Milk in 24 hours.	No. of Guinea-pig.	Mode of Injection.	Half of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
Jan. 6, 1909 [163 days after inoculation].	—	3425	Intrap.	Left	10·0 cc.	K.	69 days	No tuberculosis.
		3426	,,	,,	,,	K.	69 ,,	,, ,,
		3423	,,	Right	,,	K.	69 ,,	,, ,,
		3424	,,	,,	,,	K.	69 ,,	,, ,,
Feb. 9, 1909 [197 days after inoculation].	Left half 8·0 cc.	3460	Intrap.	Left	4·0 cc.	K.	42 days	No tuberculosis.
		3461	,,	,,	4·0 cc.	K.	42 ,,	,, ,,
	Right half 9·0 cc.	3458	,,	Right	5·0 cc	K.	42 ,,	,, ,,
		3459	,,	,,	4·0 cc.	K.	42 ,,	,, ,,

KID 71.

(Ten weeks old.)

SUCKING GOAT 61.

Duration of experiment—The kid was placed with Goat 61 on August 13, 1908, 17 days after her inoculation, and continued sucking until January 14, 1909, a period of 154 days; on this day the kid was killed.

Clinical Notes.

The kid remained well and grew normally during the experiment.

Tuberculin Tests.

No. 1. November 4, 1908. [83 days after commencement of experiment.] Dose, 1·0 cc. No reaction. Rise of temperature, 0·3° C.

No. 2. January 7, 1909. [147 days after inoculation.] Dose, 1·0 cc. Rise of temperature, 0·8 C.

Weights.

	qrs.	lbs.
August 13, 1908	1	6
January 14, 1909	2	9

Total gain of weight.—1 qr. 3 lbs.

POST-MORTEM EXAMINATION.

The carcass was in good condition.

All the organs and glands were examined and were found free from tuberculosis.

EXPERIMENT J.

GOAT 81 [Adult Female].

Intravenous inoculation of culture derived from the original material of Virus H. 115. "N.G." through Guinea-pig 3087.

Dose—2·0 milligrammes.

Date of Inoculation—December 18, 1908.

Died—January 28, 1909. [41 days after inoculation.]

Clinical Notes.

The goat was first noticed to be ill during the second week in January; she lost appetite, was quiet, and looked seedy and depressed. The loss of appetite continued, the respiration became quickened, and the goat gradually became very weak and emaciated; death ensued on the 41st day after inoculation.

Milk was withdrawn from the udder by hand (the ducts of the teats being too narrow to admit a cannula) at intervals from December 18 (the day of inoculation) until January 2 and inoculated into guinea-pigs; after this date the udder was dry and no milk could be obtained.

On January 2 milk from both halves of the udder was centrifuged and the deposit examined microscopically; no tubercle bacilli were seen.

On January 28, after death, 10·0 cc. of saline were injected into the milk sinuses of each half of the mamma. After manipulating the mamma some milky fluid was withdrawn. Microscopical examination of the fluid from each half of the mamma showed no tubercle bacilli: the fluid was inoculated into guinea-pigs.

Temperature.

The temperature was raised and irregular during the whole period of the experiment (maximum 40·4° C., minimum 38·3° C.).

Weights.

	qrs.	lbs.
December 18, 1908...	2	20
January 28, 1909	2	0

Total loss of weight.—20 lbs.

POST-MORTEM EXAMINATION.

The carcass was emaciated.

Local Lesion.—In the muscles near the middle of the left jugular vein there was a small collection of caseo-pus; the vein itself was normal.

Thorax.

Lungs.—The greater part of the right cephalic lobe, the whole of the right middle, the ventral portions of the left cephalic lobes, and the antero-ventral portions of the caudal lobes were firm, reddish and airless; the rest of the lung was congested, air-containing, but much firmer and less crepitant than normal.

The consolidated tissue showed on section greyish areas surrounded by reddish tissue, many of the grey areas (which probably corresponded to lobules) having irregular ill-defined yellowish centres.

The crepitant parts of the lungs were closely beset with grey almost transparent miliary tubercles.

Thoracic Glands.—The bronchial and dorsal mediastinal glands were much enlarged and congested; they were composed of reddish tissue mottled with small translucent grey areas; there was no sign of caseation.

Heart.—Normal.

Abdomen.

Spleen.—The spleen was soft, no tubercles were seen on the surface or on section.

Liver.—The liver was pale and firm, no tubercles were seen on the surface or on section.

Kidneys.—Normal.

Mesenteric Glands.—In one there was a large pea-sized calcareous nodule (not tuberculous).

Mammary Gland.—The mammary gland was small, the gland substance was tough, and showed on section about half a dozen yellow bodies each about 1 mm. in diameter which stood up from the cut surface; when crushed they had a fibrous wall and milky or creamy contents; no tubercle bacilli were found in smear preparations made from two; they were probably of the nature of retention cysts. There was a small quantity of milky fluid in the milk sinuses. The mucous membrane was normal.

All other organs and glands were examined and found normal.

Microscopical Examination.

Scraping from Consolidated portion of Lung.—Tubercle bacilli numerous.

Scraping from Mediastinal Gland.—Sparsely-scattered tubercle bacilli.

Nodule from Mesenteric Gland.—No tubercle bacilli.

Soft focus from the Mamma.—No tubercle bacilli.

GUINEA-PIGS INOCULATED WITH MILK OF GOAT 81.

(The milk was withdrawn by hand.)

Date.	Total yield of Milk in 24 hours.	No. of Guinea-pig.	Mode of Injection.	Half of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
Dec. 18, 1908 [before inoculation].		3399	Intrap.	Right	10·0 cc.	K.	169 days	Healthy.
		3400	„	Left	10·0 cc.	K.	169 „	„
Dec. 19, 1908 [24 hours after inoculation].	Right half 161·0 cc.	3401	Intrap.	Right	10·0 cc.	K.	51 days	General tuberculosis.
		3402	„	„	10·0 cc.	K.	51 „	Slight general tuberculosis.
		3403	„	„	10·0 cc.	K.	51 „	Slight general tuberculosis.
		3404	„	„	10·0 cc.	K.	51 „	Very slight general tuberculosis.
Dec. 20, 1908 [48 hours after inoculation].	Right half 190·0 cc.	3405	Intrap.	Right	10·0 cc.	K.	50 days	Slight general tuberculosis.
		3406	„	„	10·0 cc.	K.	50 „	Slight general tuberculosis.
		3407	„	„	10·0 cc.	K.	50 „	Early general tuberculosis.
		3408	„	„	10·0 cc.	K.	50 „	Very slight general tuberculosis.
Dec. 21, 1908 [3 days after inoculation].	Right half 187·0 cc.	3409	Intrap.	Right	10·0 cc.	K.	50 days	No tuberculosis.
		3410	„	„	10·0 cc.	K.	50 „	„ „
	Left half 185·0 cc.	3411	„	Left	10·0 cc.	K.	50 „	„ „
		3412	„	„	10·0 cc.	K.	50 „	General tuberculosis, not severe.

Guinea-pigs Inoculated with Milk of Goat 81—*continued.*

Date.	Total yield of Milk in 24 hours.	No. of Guinea-pig.	Mode of Injection.	Half of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
Dec. 26, 1908 [8 days after inoculation].	Right half 170·0 cc.	3413	Intrap.	Right	10·0 cc.	K.	77 days	No tuberculosis.
		3414	,,	,,	10·0 cc.	K.	77 ,,	Slight general tuberculosis.
	Left half 170·0 cc.	3415	,,	Left	10·0 cc.	K.	77 ,,	General tuberculosis, moderately severe.
		3416	,,	,,	10·0 cc.	K.	77 ,,	Slight general tuberculosis.
Jan. 2, 1909 [15 days after inoculation].	Right half 90·0 cc.	3417	Intrap.	Right	10·0 cc.	K.	70 days	General tuberculosis.
		3418	,,	,,	10·0 cc.	K.	70 ,,	Slight general tuberculosis.
	Left half 90·0 cc.	3419	,,	Left	10·0 cc.	K.	70 ,,	No tuberculosis.
		3420	,,	,,	10·0 cc.	K.	70 ,,	Slight general tuberculosis.

Early in January the udder became dry ; January 2 was the last occasion on which milk was withdrawn.

On January 28, 1909, 10·0 cc. of saline were injected into the milk sinuses of each half of the mamma. After manipulating the mamma some milky fluid was withdrawn through the catheter used for injecting the saline, 4·0 cc. from the right side and 5·0 cc. from the left.

Jan. 28, 1909 [41 days after inoculation].		3436	Intrap.	Right	2·0 cc. of the fluid.	K.	47 days	General tuberculosis.
		3437	,,	,,	,,	K.	47 ,,	General tuberculosis.
		3434	,,	Left	2·5 cc. of the fluid.	D.	28 ,,	General tuberculosis.
		3435	,,	,,	,,	D.	35 ,,	General tuberculosis.

EXPERIMENT K.

GOAT 75 [Young Adult Female].

Fed once with culture derived from the original material (synovial membrane of knee-joint) of Virus H. 76. "G.M." through Guinea-pig 2887.

Dose—74·0 milligrammes.

Date of Feeding—September 22, 1908.

Killed when in good health—August 16, 1909. [328 days after feeding.]

Clinical Notes.

On October 14, 22 days after feeding, centrifuged deposits of milk from the right and left halves of the udder were examined microscopically ; no tubercle bacilli were seen in either. Culture tubes sown from the deposit remained sterile.

The goat gave birth to two kids on May 30, 1909, eight months after the commencement of the experiment ; the kids sucked their mother for nearly two-and-a-half months, and when killed on August 10, 1909, were found to be perfectly healthy. The goat remained well during the experiment and was killed on August 16, 1909.

Temperature.

There was a very slight rise of temperature commencing 28 days after inoculation which lasted a week and reached a maximum of 40·0° C. With this exception the temperature was normal during the experiment.

Tuberculin Tests.

November 4, 1908. [43 days after inoculation.] Dose, 1·0 cc. Reacted. Rise of temperature 1·6° C.

January 7, 1909. [107 days after inoculation.] Dose, 1·0 ce. Reacted Rise of temperature 2·0° C.

Weights.

	qrs.	lbs.
September 22, 1908	2	16
August 16, 1909	3	4

Gain of weight.—16 lbs.

POST-MORTEM EXAMINATION.

The carcass was in good condition.

Alimentary Tract.

Tongue, Pharynx, Tonsils.—Normal.

Submaxillary Glands.—In the cortex of the left there was a group of three or four small calcareous tubercles ; the right was normal.

Retro-pharyngeal Glands.—In the right pharyngeal gland there was a calcareous tubercle and two calcareous grains ; the left was normal.

Parotideal Glands.—The left contained a few minute calcareous grains ; the right was normal.

Cervical Glands.—Normal.

Intestines.—Normal.

Mesenteric Glands.—The large terminal gland contained an irregular calcareous patch and a few calcareous tubercles; one in the middle of the mesentery showed a millet-seed sized calcareo-caseous tubercle. Other mesenteric glands were normal.

Ileo-colic Glands.—Six out of seven glands were affected, but were not obviously enlarged; three contained rather large calcareo-caseous patches; two showed a calcareo-caseous nodule or two, and in the other there was a single hemp-seed sized caseous nodule.

Portal Glands.—One portal gland contained a calcareo-caseous nodule the size of a pea and a millet-seed sized calcareous tubercle; other portal glands were normal.

Mammary Gland.—Normal.

There was no sign of tuberculosis elsewhere.

Microscopical Examination.

Smear from the Spleen Substance.—No tubercle bacilli.

Nodule from a Portal Gland.—A few tubercle bacilli.

GUINEA-PIGS INOCULATED WITH MILK OF GOAT 75.

Date.	Total yield of Milk in 24 hours.	No. of Guinea-pig.	Mode of Injection.	Half of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
Sept. 22, 1908 [before inoculation].		3280	Intrap.	Left	10·0 cc.	K.	256 days	No tuberculosis.
		3281	„	Right	10·0 cc.	D.	118 „	No tuberculosis. Death during parturition.
		3282	„	Mixed milk.	10·0 cc.	K.	256 „	No tuberculosis.
Sept. 24, 1908 [48 hours after inoculation].	Left half 70·0 cc.	3283	Intrap.	Left	10·0 cc.	K.	72 days	No tuberculosis.
		3284	„	„	10·0 cc.	K.	72 „	„ „
	Right half 50·0 cc.	3285	„	Right	10·0 cc.	K.	72 „	„ „
		3286	„	„	10·0 cc.	K.	72 „	„ „
Sept. 26, 1908 [4 days after inoculation].	Left half 91·0 cc.	3291	Intrap.	Left	10·0 cc.	K.	81 days	No tuberculosis.
		3292	„	„	10·0 cc.	K.	81 „	„ „
	Right half 77·0 cc.	3293	„	Right	10·0 cc.	K.	81 „	„ „
		3294	„	„	10·0 cc.	K.	81 „	„ „
Sept. 28, 1908 [6 days after inoculation]	Left half 68·0 cc.	3297	Intrap.	Left	10·0 cc.	K.	79 days	No tuberculosis.
		3298	„	„	10·0 cc.	K.	79 „	„ „
	Right half 67·0 cc.	3295	„	Right	10·0 cc.	K.	79 „	„ „
		3296	„	„	10·0 cc.	K.	79 „	„ „
Sept. 30, 1908 [8 days after inoculation].	Left half 82·0 cc.	3303	Intrap.	Left	10·0 cc.	K.	83 days	No tuberculosis.
		3304	„	„	10·0 cc.	K.	83 „	„ „
	Right half 70·0 cc.	3301	„	Right	10·0 cc.	K.	83 „	„ „
		3302	„	„	10·0 cc.	K.	83 „	„ „
Oct. 2, 1908 [10 days after inoculation].	Left half 101·0 cc.	3309	Intrap.	Left	10·0 cc.	K.	96 days	No tuberculosis.
		3310	„	„	10·0 cc.	K.	96 „	„ „
	Right half 61·0 cc.	3311	„	Right	10·0 cc.	K.	96 „	„ „
		3312	„	„	10·0 cc.	K.	96 „	„ „
Oct. 4, 1908 [12 days after inoculation].	Left half 70·0 cc.	3315	Intrap.	Left	10·0 cc.	K.	93 days	No tuberculosis.
		3316	„	„	10·0 cc.	K.	93 „	„ „
	Right half 40·0 cc.	3313	„	Right	10·0 cc.	D.	81 „	„ „
		3314	„	„	10·0 cc.	K.	93 „	„ „
Oct. 6, 1908 [14 days after inoculation].	Left half 123·0 cc.	3319	Intrap.	Left	10·0 cc.	K.	92 days	No tuberculosis.
		3320	„	„	10·0 cc.	K.	92 „	„ „
	Right half 80·0 cc.	3317	„	Right	10·0 cc.	K.	92 „	„ „
		3318	„	„	10·0 cc.	K.	92 „	„ „

GUINEA-PIGS INOCULATED WITH THE MILK OF GOAT 75—*continued.*

Date.	Total yield of Milk in 24 hours.	No. of Guinea-pig.	Mode of Injection.	Half of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
Oct. 14, 1908 [22 days after inoculation].	Left half 80·0 cc.	3325	Intrap.	Left	10·0 cc.	K.	86 days	No tuberculosis.
		3326	,,	,,	10·0 cc.	K.	86 ,,	,, ,,
	Right half 70·0 cc.	3327	,,	Right	10·0 cc.	K.	86 ,,	,, ,,
		3328	,,	,,	10·0 cc.	K.	86 ,,	,, ,,
Oct. 28, 1908 [36 days after inoculation].	Left half 46·0 cc.	3341	Intrap.	Left	10·0 cc.	K.	98 days	No tuberculosis.
		3342	,,	,,	10·0 cc.	K.	98 ,,	,, ,,
	Right half About 21·0 cc.	3339	,,	Right	10·0 cc.	K.	98 ,,	,, ,,
		3340	,,	,,	10·0 cc.	K.	98 ,,	,, ,,
Nov. 6, 1908 [45 days after inoculation].	Left half 11·0 cc.	3350	Intrap.	Left	10·0 cc.	K.	92 days	No tuberculosis.
	Right half 2·0 cc.	3349	,,	Right	2·0 cc.	K.	92 ,,	,, ,,
June 7, 1909 [258 days after inoculation, 8 days after giving birth to two kids].	—	3777	Intrap.	Left	10·0 cc.	K.	77 days	No tuberculosis.
		3778	,,	,,	10·0 cc.	K.	77 ,,	,, ,,
		3779	,,	Right	10·0 cc.	K.	77 ,,	,, ,,
		3780	,,	,,	10·0 cc.	K.	77 ,,	,, ,,

RABBITS INOCULATED WITH MILK OF GOAT 75.

Date.	No. of Rabbit.	Mode of Injection.	Half of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
Sept. 24, 1908 [48 hours after inoculation].	2016	Subcut. Intrap.	Left	40·0 cc. 10·0 cc.	K.	148 days	No tuberculosis.
	2017	Subcut.	Right	30·0 cc.	D.	19 ,,	No tuberculosis. The cause of death was not apparent.

ABSTRACTS OF THE CASES AND DETAILED RESULTS OF THE INVESTIGATIONS SUMMARISED IN PART II OF THE REPORT.

Case 1.—HEIFER-CALF 1479.

Subcutaneous inoculation of culture derived from a guinea-pig inoculated with an emulsion of a bronchial gland from Calf 1325 (3rd passage), Virus H. 79. "J.N."

Dose—100·0 milligrammes.

Age at Inoculation—6 months.

Killed when in good health—110 days after inoculation.

ABSTRACT OF POST-MORTEM NOTES.

(For full details *see* the Report on Cases of Human Tuberculosis other than Lupus.)

There was a cyst at the seat of inoculation and the adjacent glands contained caseous gritty masses. The suprarenal bodies contained nearly two dozen calcareous tubercles. The mesenteric, ileo-colic, and a few other abdominal glands contained discrete calcareous tubercles, the thoracic glands contained small calcareous patches. One supramammary gland contained a calcareous grain.

The mamma was normal.

Some saline was injected into each of the mammary sinuses and a small quantity of turbid fluid recovered from each. No tubercle bacilli were demonstrated in smear preparations made from the fluid.

GUINEA-PIGS INOCULATED.

—	No. of Guinea-pig.	Mode of Inoculation.	Dose.	Duration of Life.	Result.
Mixed fluids from the two fore-quarters of the mamma	3566	Intrap.	Small	K. 62 days	General tuberculosis.
	3567	„	„	K. 62 „	General tuberculosis.
Mixed fluids from the two hind-quarters	3568	Intrap.	Slightly larger.	D. 58 „	General tuberculosis.
	3569	„	„	K. 62 „	General tuberculosis.

Case 2.—HEIFER-CALF 1601.

Subcutaneous inoculation of culture derived from the original material of Virus H. 143. "L.L." through Guinea-pig 3536.

Dose—68·0 milligrammes.

Age at Inoculation—4 months.

Killed when in good health—91 days after inoculation.

ABSTRACT OF POST-MORTEM NOTES.

(For full details *see* the Report on Cases of Human Tuberculosis other than Lupus.)

There was a cyst containing thin pus and caseo-necrotic masses at the seat of inoculation; the adjacent prescapular gland contained a fibro-caseous mass, and one left prepectoral gland was fibro-caseous throughout; and one cervical gland contained a caseo-calcareous nodule.

Half a dozen minute grey tubercles with calcareous centres were seen in the lungs, and each suprarenal body contained seven or eight miliary caseous tubercles. A moderate number of minute caseous foci were seen in the ileo-colic glands.

The mamma and supramammary glands were normal.

Four cubic centimetres of saline solution were injected into each of the mammary sinuses and about 3 cc. of slightly milky fluid were recovered in each case. One or two tubercle bacilli were seen in smear preparations made from the fluids recovered from the left fore, right fore, and right hind quarters, none was seen in that from the left hind quarter.

GUINEA-PIGS INOCULATED.

—		No. of Guinea-pig.	Mode of Inoculation.	Dose.	Duration of Life.	Result.
With the fluids recovered from—	The left fore quarter ...	3931	Intrap.	3·0 cc.	K. 70 days	General tuberculosis.
	The left hind quarter ...	3933	„	„	D. 47 „	General tuberculosis.
	The right fore quarter ...	3930	„	„	K. 70 „	General tuberculosis.
	The right hind quarter...	3932	„	„	K. 70 „	General tuberculosis.

Case 3.—HEIFER-CALF 1461.

Subcutaneous inoculation of culture derived from the thoracic gland of Calf 1367 (3rd passage), Virus H. 53. "D.H." (*a*).

Dose—50·0 milligrammes.

Age at Inoculation—6 months.

Killed when in good health—111 days after inoculation.

ABSTRACT OF POST-MORTEM NOTES.

(For full details *see* the Report on Lupus Viruses.)

There was a cyst at the seat of inoculation containing turbid fluid and caseo-necrotic masses. The adjacent prescapular gland was mainly composed of caseo-calcareous tissue. One prepectoral and one cervical gland were similarly affected.

In the thoracic glands there were a few scattered calcareous foci. The right supramammary gland contained a group of three caseous and softened tubercles.

The milk sinuses contained a small quantity of opalescent fluid; in the fluid from one quarter a moderate number of tubercle bacilli were seen on microscopical examination. The mammary tissue was normal.

GUINEA-PIG INOCULATED.

—	No. of Guinea-pig.	Mode of Inoculation.	Duration of Life.	Result.
With a few drops of the fluid from one quarter of the mamma.	3476.	Intrap.	Killed 33 days	Early general tuberculosis.

Case 4.—HEIFER-CALF 1535.

Subcutaneous inoculation of culture derived from the original material of Virus H 53. "D.H." (*b*), through Guinea-pig 3216.

Dose—50·0 milligrammes.

Age at Inoculation—About 3 months.

Killed when in good health—103 days after inoculation.

ABSTRACT OF POST-MORTEM NOTES.

(For full details *see* the Report on Lupus Viruses.)

There was a large thin-walled cyst at the seat of inoculation containing caseo-pus and caseous masses; the adjacent prescapular gland was enlarged, dense, and caseous throughout. The lungs showed on the surface a very few minute calcareous tubercles and some minute grey foci; the spleen contained scattered calcareous tubercles.

The Peyer's patches of the small intestine contained altogether several yellow foci and three small ulcers, slightly calcareous; several small ulcers without caseation or calcification were also seen in the intestines. Nearly every lymphatic gland in the body contained caseous or calcareous tubercles or nodules more or less numerous.

The supramammary glands contained altogether 10 caseous gritty nodules up to 2 mm. in diameter.

The mamma was normal; the milk sinuses of the right fore quarter contained 2 or 3 cc. of purulent fluid; the fluid contained yellow shreds which were casts of the smaller ducts; on standing these fell to the bottom, leaving a slightly turbid supernatant fluid. On microscopical examination of the pus tubercle bacilli were found, sparsely scattered; one was seen inside a leucocyte. There was no pus in the other quarters of the udder.

A quantity of saline solution was injected into the left fore quarter and the hind quarters of the udder; with the fluids recovered from two of these quarters guinea-pigs were inoculated. No tubercle bacilli were seen in smear preparations of the fluids recovered from the hind quarters.

Guinea-pigs Inoculated.

—	No. of Guinea-pig.	Mode of Inoculation.	Duration of Life.	Result.
With pus from the right fore quarter ...	3749	Intrap.	Died 77 days	Severe general tuberculosis.
With fluid recovered from the left fore quarter	3750	Intrap.	Killed 97 ,,	No tuberculosis.
With fluid recovered from the right hind quarter	3751	Intrap.	Killed 97 ,,	No tuberculosis.
	3752	Intrap.	Killed 97 ,,	No tuberculosis.

Case 5.—HEIFER-CALF 1571.

Subcutaneous inoculation of culture derived from the small mediastinal gland of Calf 1561 (1st passage) Virus H. 53. "D.H." (*b*).

Dose—50·0 milligrammes.

Age at Inoculation—3½ months.

Killed when in good health—111 days after inoculation.

ABSTRACT OF POST-MORTEM NOTES.

(For full details *see* the Report on Lupus Viruses.)

There was a small fibrous-walled cyst with caseous and softened contents at the seat of inoculation. The adjacent prescapular gland was extensively caseo-calcareous and softened, one cervical gland showed a calcareous patch, and one prepectoral gland a calcareous focus. There were three small tubercles in the spleen and a caseous gritty nodule in one suprarenal body. Two thoracic and five abdominal glands each contained one or more minute calcareous or caseous foci.

The mamma, and supramammary glands, were normal.

Three cubic centimetres of saline solution were injected into each of the mammary sinuses and about 1 cc. of very slightly milky fluid was recovered in each case. No tubercle bacilli were seen in these fluids on microscopical examination.

Guinea-pigs Inoculated.

—		No. of Guinea-pig.	Mode of Inoculation.	Dose.	Duration of Life.	Result.
With the fluids recovered from—	The left fore quarter ...	3907	Intrap.	Rather less than 1·0 cc.	K. 62 days	No tuberculosis.
	The left hind quarter ...	3905	,,	,,	K. 62 ,,	No tuberculosis.
	The right fore quarter ...	3904	,,	,,	D. 13 ,,	No tuberculosis.
	The right hind quarter...	3906	,,	,,	K. 62 ,,	No tuberculosis.

Case 6.—HEIFER-CALF 1505.

Subcutaneous inoculation of culture derived from the lung of Calf 1453, Virus H 107. "H.H."

Dose—100 0 milligrammes.

Age at Inoculation—5 months.

Killed when in good health—101 days after inoculation.

ABSTRACT OF POST-MORTEM NOTES.

(For full details *see* the Report on Lupus Viruses.)

There was a small fibroid local tumour containing a cavity filled with caseo-pus; the adjacent prescapular gland and one prepectoral gland were fibro-caseo-calcareous. Scattered ulcerated nodules containing yellow pus (smear, T.B.) were seen in the small intestine; there was one in the large intestine. The mamma and the supramammary lymphatic glands were normal.

Some saline was injected into each of the mammary sinuses and a small quantity of slightly turbid fluid recovered from each. No tubercle bacilli were seen in the mixed fluids from the two fore quarters or in that from the two hind quarters on microscopical examination.

GUINEA-PIGS INOCULATED.

—	No. of Guinea-pig.	Mode of Inoculation.	Dose.	Duration of Life.	Result.
Mixed fluids from the fore-quarters of the mamma	3707	Intrap.	2·0 cc.	Killed 28 days	No tuberculosis.
	3708	„	2·0 cc.	Killed 44 „	„
Mixed fluid from the hind-quarters	3705	Intrap.	2·5 cc.	Killed 28 „	„
	3706	„	2·5 cc.	Killed 44 „	„

Case 7.—HEIFER-CALF 1549.

Subcutaneous inoculation of culture derived from the mediastinal gland of Calf 1497 Virus H. 107. "H.H."

Dose—50·0 milligrammes.

Age at Inoculation—10 weeks.

Killed when in good health—97 days after inoculation.

ABSTRACT OF POST-MORTEM NOTES.

(For full details *see* the Report on Lupus Viruses.)

Slight general tuberculosis, apparently progressive in thoracic glands.

There was a fibrous-walled cystic local tumour filled with caseo-pus and caseous masses; the adjacent prescapular gland was enlarged and caseous. The liver, spleen and lungs contained scattered calcareous or caseo-calcareous miliary tubercles, the kidneys a few grey tubercles. The lungs also showed on the surface in certain limited areas patches of fibro-calcareous tubercles, and a few scattered caseous gritty nodules.

In the right side of the heart about fifty grey nodules up to 6 mm. in diameter were counted, the majority with calcareous centres, and in the first few inches of the pulmonary artery several small fibrous tubercles were seen.

The thoracic glands were much enlarged and mainly occupied by caseous gritty tracts and patches of calcareous tubercles: the portal and one coeliac gland were similar.

In each suprarenal about a dozen grey nodules with caseo-calcareous centres were seen. Very numerous congested nodules each with a small central ulcer were seen in the small intestine and the Peyer's patches were thickened, ulcerated and beset with calcareous patches and foci.

The abdominal lymphatic glands not hitherto mentioned contained numerous calcareous tubercles, the mesenteric and ileo-colic glands being severely affected. An occasional tubercle was seen in the peripheral glands and in several haemo-lymph glands.

The mamma was well-developed; many of the milk ducts contained short plugs of purulent substance. No tubercles were seen in the organ.

Saline was injected into the mammary sinuses; the fluid recovered was milky, and deposited on standing yellow pus composed of the plugs from the ducts. The fluids from the two fore quarters were mixed together, as were also those from the hind quarters. A few tubercle bacilli were seen in smear preparations made from the mixed fluids. No guinea-pigs were inoculated.

Case 8. HEIFER-CALF 1577.

Subcutaneous inoculation of culture derived from the bronchial gland of Calf 1551 (2nd passage), Virus H. 107. "H.H."

Dose—50·0 milligrammes.

Age at inoculation—3½ months.

Killed when in good health—103 days after inoculation.

ABSTRACT OF POST-MORTEM NOTES.

(For full details *see* the Report on Lupus Viruses.)

There was a fibrous-walled cyst with caseo-purulent contents at the seat of inoculation. The adjacent prescapular gland was extensively, and one prepectoral gland was entirely, caseous; two other adjacent glands contained each a calcareous nodule. Each suprarenal body showed one miliary tubercle. The thoracic glands contained a few minute caseous or calcareous foci, and three abdominal glands contained one each.

The mamma, and supramammary glands, were normal.

Four cubic centimetres of saline solution were injected into each of the mammary sinuses and about 3·0 cc. of fluid (very slightly milky) were recovered in each case.

No tubercle bacilli were seen in the fluids on microscopical examination.

GUINEA-PIGS INOCULATED.

—		No. of Guinea-pig.	Mode of Inoculation.	Dose.	Duration of Life.	Result.
With the fluids recovered from—	The left fore quarter ...	3916	Intrap.	3·0 cc.	K. 60 days	No tuberculosis.
	The left hind quarter ...	3914	,,	,,	K. 60 ,,	No tuberculosis.
	The right fore quarter ...	3917	,,	,,	D. 28 ,,	No tuberculosis.
	The right hind quarter...	3915	,,	,,	D. 16 ,,	No tuberculosis.

Case 9. HEIFER-CALF 1583.

Subcutaneous inoculation of culture derived from the mediastinal gland of Calf 1549 (1st passage). Virus H. 107. "H.H."

Dose—50·0 milligrammes.

Age at inoculation—11 weeks.

Killed when in good health—127 days after inoculation.

ABSTRACT OF POST-MORTEM NOTES.

(For full details *see* the Report on Lupus Viruses.)

There was a small cyst containing caseous masses and turbid fluid at the seat of inoculation, the adjacent prescapular gland contained caseous and caseo-calcareous nodules, and one cervical gland was beset with calcareous foci. One suprarenal body contained a minute calcareous focus. The thoracic and two or three abdominal lymphatic glands contained one or more calcareous foci, mostly minute.

The udder was small and showed very little glandular tissue; the supramammary glands were normal.

Four cubic centimetres of saline solution were injected into each of the mammary sinuses and about 3·0 cc. of fluid were recovered from each. No tubercle bacilli were seen in these four fluids on microscopical examination.

GUINEA-PIGS INOCULATED.

—		No. of Guinea-pig.	Mode of Inoculation.	Dose.	Duration of Life.	Result.
With the fluids recovered from—	The left fore quarter ...	3912	Intrap.	3·0 cc.	K. 56 days	No tuberculosis.
	The left hind quarter ...	3910	,,	,,	K. 56 ,,	No tuberculosis.
	The right fore quarter ...	3913	,,	,,	K. 56 ,,	No tuberculosis.
	The right hind quarter ..	3911	,,	,,	K. 56 ,,	No tuberculosis.

Case 10.—HEIFER-CALF 1533.

Subcutaneous inoculation of culture derived from the mediastinal gland of Calf 1417, Virus H. 108. "H.R."

Dose—50·0 milligrammes.

Age at Inoculation—About 4 months.

Killed when in good health—98 days after inoculation.

ABSTRACT OF POST-MORTEM NOTES.

(For full details *see* the Report on Lupus Viruses.)

Slight retrogressive generalised tuberculosis.

There was a large thin-walled cyst at the seat of inoculation containing caseo-pus and caseous masses; the adjacent prescapular gland was large and composed of caseous gritty substance. The lungs contained sixteen small nodules with caseo-calcareous centres, the spleen a moderate number of fibro-caseous gritty tubercles, the liver similar but less numerous tubercles, the right kidney two caseo-calcareous tubercles, the left a minute focus, the right suprarenal body two caseous gritty nodules, the left a caseous tubercle. Nearly every Peyer's patch in the small intestine contained a few caseo-calcareous tubercles.

All the lymphatic glands in the body contained caseo-calcareous tubercles more or less numerous, in some cases confluent; several mesenteric and the ileo-colic glands were more than half caseo-calcareous. Every haemo-lymph gland examined contained a caseo-calcareous tubercle. The mamma was normal.

Some saline was injected into each of the mammary sinuses and small quantity of slightly turbid fluid recovered from each. No tubercle bacilli were seen in the mixed fluids from the fore quarters or in that from the hind quarters on microscopical examination.

GUINEA-PIGS INOCULATED.

—	No. of Guinea-pig.	Mode of Inoculation.	Dose.	Duration of Life.	Result.
Mixed fluids from the fore quarters of the mamma	3736	Intrap.	Small	Killed 72 days	Slight general tuberculosis.
Mixed fluids from the hind quarters of the mamma	3737	Intrap.	Small	Killed 72 ,,	No tuberculosis.

Case 11.—HEIFER 80.

Subcutaneous inoculation of an emulsion made from the original material (a mediastinal gland) of Virus B. V.

Dose—4,500,000 tubercle bacilli (Vol. 2·32 cc.).

Age at Inoculation—About 18 months.

Killed when in good health—62 days after inoculation.

ABSTRACT OF POST-MORTEM NOTES.

(For full details *see* Vol. I of the Appendix to the 2nd Interim Report, page 198.)

Slight generalised tuberculosis.

The tumour at the seat of inoculation was mainly composed of dense caseating tissue; the adjacent glands were partly fibroid and contained caseous foci and patches. The lungs showed sparsely scattered congested nodules containing yellow foci up to a large pea in size. Caseous tubercles were scanty in the mediastinal and numerous in the bronchial glands. There were three caseating tubercles in the spleen, and five greyish nodules each containing a minute caseous focus in the liver. One pancreatic gland contained a group of small yellow tubercles. There was no sign of tuberculosis elsewhere.

The uterus contained a 5 months old foetus. A guinea-pig inoculated with an emulsion of its spleen remained healthy.

The mammary sinuses contained a small quantity of thick yellowish turbid fluid; a smear preparation made from it showed no tubercle bacilli.

GUINEA-PIG INOCULATED.

—	No. of Guinea-pig.	Mode of Inoculation.	Duration of Life.	Result.
With a small quantity of the fluid from the mammary sinuses	816	Intrap.	Killed 88 days	General tuberculosis.

Case 12. HEIFER-CALF 1569.

Subcutaneous inoculation of culture derived from the original material of Virus H. 127. "R.R." (*a*) through Guinea-pig 3475.

Dose—50·0 milligrammes.

Age at inoculation—About 12 weeks.

Killed when in good health—105 days after inoculation.

ABSTRACT OF POST-MORTEM NOTES.

(For full details *see* the Report on Cases of Human Tuberculosis other than lupus.)

Slight general tuberculosis, apparently retrogressive.

There was an ulcerated fibro-calcareous tumour at the seat of inoculation and the adjacent glands were fibro caseo-calcareous or contained discrete tubercles.

The lungs showed a moderate number of tubercles up to 2 mm., the smaller grey the larger caseous and calcareous, and also a few consolidated lobules which were fibro-calcareous. The spleen contained a moderate number of miliary caseo-calcareous tubercles, the liver scattered calcareous tubercles.

The thoracic and abdominal glands contained scattered calcareous tubercles and calcareous patches, the peripheral glands caseous gritty miliary tubercles.

The udder was well formed but not very large; it appeared normal. The supramammary glands were normal.

Thin grey purulent fluid was expressed from the teats of three of the quarters; the sinuses and ducts of the right hind quarter contained a large quantity but there was only a small quantity in each of the fore quarters; microscopical examination of these fluids showed a few tubercle bacilli in each case From the left hind quarter no pus could be expressed and this quarter was washed out with salt solution; microscopical examination of the recovered fluid showed no tubercle bacilli.

Case 13.—GOAT 77 [Young Adult Female].

Subcutaneous inoculation of culture derived from the original material of Virus H. 118. "F.C." (sputum) through Guinea-pig 3343.

Dose—25·0 milligrammes.

Date of Inoculation—February 12, 1909.

Killed when in good health—June 8, 1909. [116 days after inoculation.]

Clinical Notes.

A large tumour developed at the seat of inoculation on the left side of the neck. On March 8, 24 days after inoculation it extended from the midde of the neck into the dewlap ; it was soft and fluctuating, and the skin over it was thin and red. The adjacent prescapular gland was enlarged. Twelve days later the tumour burst and its contents were evacuated.

On April 5, 52 days after inoculation, the goat gave birth to two dead full-time foetuses ; on post-mortem examination their organs and glands were found to be normal ; a smear made from a portal gland in each case showed no tubercle bacilli.

Milk withdrawn from the udder by means of a catheter eight hours, one day, two days, 8, 14, 28 and 59 days after the birth of the kids, was inoculated into guinea-pigs.

The milk withdrawn from each half of the udder on April 5 (eight hours after parturition) was examined microscopically ; it was thick and creamy-yellow in colour ; no tubercle bacilli were seen. Centrifuged deposit from the milk was also microscopically examined with a negative result. Culture tubes were sown with the milk ; no growth resulted.

Two days after the kids were born centrifuged deposits of milk from the right and the left halves of the udder were again examined microscopically ; no tubercle bacilli were seen.

The goat remained in good health during the experiment.

Temperature.

The temperature was raised for a period of 19 days after the inoculation (maximum 40·5° C. on the 7th day) ; from the 19th to the 27th day it was irregular ; subsequently it was normal, the range of variation during three months being only 1·0 C. (maximum 39·0°, minimum 38·0° C.).

Weights.

	qrs.	lbs.
February 12, 1909	2	19
June 8, 1909	2	9

Loss of weight—10 lbs.

POST-MORTEM EXAMINATION.

The carcass was in good condition.

Local Lesion.—At the seat of inoculation there was a tumour measuring 6·5 by 4 by 2 cm. composed of caseous gritty nodules and masses set in fibrous tissue ; the skin over it showed an ulcer 4·5 by 2 cm. in area with red granular floor showing dry haemorrhagic scabs and thickened inverted margins.

Left Prescapular Gland.—The left prescapular gland measured 4·5 by 2 by 1·5 cm. and showed in the cortex scattered caseo-calcareous nodules ranging from 2 to 7 mm. in diameter.

At the inferior extremity of the gland there were several discrete caseo-calcareous nodules in loose connective tissue.

Right Prescapular Gland.—The right prescapular gland measured 3·3 by 1·4 by 1 cm. and showed in the cortex a small group of about half a dozen caseo-calcareous tubercles.

Cervical Glands.—On the left side one of the lower cervical glands contained a pea-sized caseo-calcareous nodule and several small tubercles.

The rest were normal.

Lungs.—The lungs were crepitant and collapsed normally. They showed under the pleura sparsely scattered, evenly distributed, uniformly caseous gritty tubercles ranging from about 0·5 to rather more than 1· mm. in diameter. Here and there was a tubercle with a grey margin and caseo-calcareous centre.

There was no sign of disease elsewhere.

The mammary gland was normal.

GUINEA-PIGS INOCULATED WITH THE MILK OF GOAT 77.

(All the milk was drawn with a catheter.)

Date.	Total yield of Milk in 24 hours.	No. of Guinea-pig.	Mode of Injection.	Half of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
April 5, 1909 [52 days after inoculation ; 8 hours after giving birth to two dead fœtuses].	Left 115·0 cc.	3677	Intrap.	Left	10·0 cc.	D.	35 days	No tuberculosis. ? cause of death.
		3678	,,	,,	10·0 cc.	D.	30 ,,	No tuberculosis. Death probably from injuries.
	Right 170·0 cc.	3679	,,	Right	10·0 cc.	K.	36 ,,	No tuberculosis.
		3680	,,	,,	10·0 cc.	D.	33 ,,	No tuberculosis. ? cause of death.
April 6, 1909 [53 days after inoculation ; 1 day after parturition].	Left 140·0 cc.	3687	Intrap.	Left	10·0 cc.	K.	51 days	No tuberculosis.
		3688	,,	,,	10·0 cc.	K.	51 ,,	,, ,,
	Right 220·0 cc.	3685	,,	Right	10·0 cc.	K.	51 ,,	,, ,,
		3686	,,	,,	10·0 cc.	K.	51 ,,	,, ,,
April 7, 1909 [54 days after inoculation ; 2 days after parturition].	Left 100·0 cc.	3695	Intrap.	Left	10·0 cc.	K.	56 days	No tuberculosis.
		3696	,,	,,	10·0 cc.	K.	56 ,,	,, ,,
	Right 150·0 cc.	3693	,,	Right	10·0 cc.	K.	56 ,,	,, ,,
		3694	,,	,,	10·0 cc.	K.	56 ,,	,, ,,

Guinea-pigs Inoculated with the Milk of Goat 77—*continued*.

Date.	Total yield of Milk in 24 hours.	No. of Guinea-pig.	Mode of Injection.	Half of Udder.	Dose of Milk.	Killed or Died.	Duration of Life.	Result.
April 13, 1909 [60 days after inoculation : 8 days after parturition].	Left 160·0 cc.	3701	Intrap.	Left	10·0 cc.	K.	56 days	No tuberculosis.
		3702	,,	,,	10·0 cc.	K.	56 ,,	,, ,,
	Right 220·0 cc.	3703	,,	Right	10·0 cc.	K.	56 ,,	,, ,,
		3704	,,	,,	10·0 cc.	K.	56 ,,	,, ,,
April 19, 1909 [66 days after inoculation ; 14 days after parturition].	Left 229·0 cc.	3722	Intrap.	Left	9·0 cc.	K.	53 days	No tuberculosis.
		3723	,,	,,	10·0 cc.	K.	53 ,,	,, ,,
	Right 280·0 cc.	3720	,,	Right	10·0 cc.	K.	53 ,,	,, ,,
		3721	,,	,,	10·0 cc.	K.	53 ,,	,, ,,
May 3, 1909 [80 days after inoculation ; 28 days after parturition].	Left 240·0 cc.	3745	Intrap.	Left	10·0 cc.	K.	74 days	No tuberculosis.
		3746	,,	,,	10·0 cc.	K.	74 ,,	,, ,,
	Right 300·0 cc.	3747	,,	Right	10·0 cc.	K.	74 ,,	,, ,,
		3748	,,	,,	10·0 cc.	K.	74 ,,	,, ,,
June 3, 1909 [111 days after inoculation 59 days after parturition].	Left 190·0 cc.	3769	Intrap.	Left	10·0 cc.	K.	55 days	No tuberculosis.
		3770	,,	,,	10·0 cc.	K.	55 ,,	,, ,,
	Right 230·0 cc.	3767	,,	Right	10·0 cc.	K.	55 ,,	,, ,,
		3768	,,	,,	10·0 cc.	K.	55 ,,	,, ,,

INVESTIGATION OF TUBERCLE BACILLI FROM CASES OF SWINE TUBERCULOSIS

BY

F. GRIFFITH, M.B.

AND

A. STANLEY GRIFFITH, M.D.

INVESTIGATION OF TUBERCLE BACILLI FROM CASES OF SWINE TUBERCULOSIS.

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Note.—The remaining viruses were inoculated into Rabbits and Guinea-pigs only. These experiments are not charted ; the results will be found in the tabular summaries on pages 177–206.

INTRODUCTION.

This report gives the results of the inquiry into the nature of the tubercle bacilli concerned in the production of tuberculosis in swine, and is based upon the investigation of material from 63 cases of natural tuberculosis. The material used was taken from swine which had been found to be tuberculous at the slaughterhouse, the extent to which these animals were diseased ranging from tuberculosis seemingly limited to certain lymphatic glands to tuberculosis generalised throughout the body. Out of the total number of swine slaughtered at the Metropolitan Meat Market during the period from March, 1905, to October, 1906, those showing apparently localised tuberculosis were specially sought for to furnish material for investigation. In addition material was obtained from cases of general tuberculosis of all degrees of severity, and the cultures obtained were isolated sometimes from the submaxillary glands, sometimes from metastatic lesions.

The cases which were considered to have been localised include all those in which the examination ordinarily adopted at the slaughterhouse revealed no obvious tuberculosis elsewhere. But there must be remembered the possibility of early lesions having been overlooked, and indeed it is difficult to believe that such extensive local tuberculosis as was found in Viruses XXXIII., XXXVI., LI., and LII., could exist in young animals such as these without any dissemination having occurred. In 21 out of the 63 swine from which tuberculous material was obtained the disease was stated to be localised; in nine no details were given as to the condition of the rest of the body; the remaining 33 showed generalised tuberculosis varying in severity.

This series shows clearly that natural tuberculosis in swine arises by infection from the alimentary tract, and that the disease when localised is usually limited to the glands situated near the angle of the jaw. These, the submaxillary glands, have been most often used as the source of cultures both because the disease was sometimes limited to them and also because they were the glands nearest the site of entry of the tubercle bacilli to the alimentary tract. Cultures were obtained altogether from 59 of the cases; the sources from which they were isolated are as follows:—Submaxillary glands (44), bronchial glands (4), spleen (2), mesenteric glands (2), submaxillary and bronchial gland (1), skin, bone, joint, lung, udder, and inguinal gland (each 1). From the remaining four viruses cultures were not obtained, nor did the animals inoculated with the original material develop tuberculosis.

In certain instances, when several animals in a single herd have been tuberculous, specimens have been taken from one or two individuals only.

Method of Investigation.

The specimens on arrival were carefully examined and the tuberculous lesions which appeared most suitable for experimental purposes were selected. From this material emulsions for cultures and animal inoculations were made in the usual way; the surface of each part selected was seared with a Paquelin's cautery and pieces were removed with sterile instruments and emulsified with salt solution, the procedures being the same as those described in a previous report (Appendix to 2nd Interim Report, Vol. III, page 3). In all cases cultures were sown direct from the original material, and guinea-pigs were almost invariably and rabbits occasionally inoculated with emulsions of the fresh material.

The pathogenic effects of the various viruses have been investigated by the inoculation of culture obtained in all but four instances direct from the original material; the inoculations of guinea-pigs and rabbits with emulsions of the original material were made with the object of obtaining a culture from them should the direct culture fail, as well as to afford some preliminary indication of the virulence of the bacillus. The virulence of the cultures of all the viruses has been tested on rabbits and guinea-pigs and cultures of fifteen viruses have also been inoculated into calves. Rabbits have been systematically employed in place of calves for testing the pathogenic properties of the cultures since it has been established in previous investigations that, when a virus shows full virulence for rabbits by the various methods of inoculation, it will be capable also of setting up progressive tuberculosis in the calf.

CONSIDERATION OF RESULTS.

In this investigation a study has been made of the cultural characters and virulence of tubercle bacilli obtained from 59 cases of tuberculosis occurring naturally in swine.

The bacilli isolated from these cases have manifested wide variations in the character of their growth on artificial media and in their virulence for animals, and can be divided into three groups clearly distinguished from each other.

The group from which bovine tubercle bacilli were isolated.

In this group, by far the largest of the three, are included 50 out of the total number of swine viruses investigated. The cultures isolated correspond exactly with those obtained from cases of natural tuberculosis in the ox. They vary in capacity for growth on artificial media within the same limits as the bovine tubercle bacillus and exhibit the same high degree of virulence when inoculated into calves, rabbits, and guinea-pigs.

All the 50 cultures have been inoculated into rabbits (intravenously, intraperitoneally, and subcutaneously), and guinea-pigs (intraperitoneally and subcutaneously), and have produced in these animals without exception fatal general tuberculosis.

In addition seven have been inoculated subcutaneously into calves in doses of 50 milligrammes; and, with one exception, have caused severe and fatal tuberculosis within 48 days identical in all its features with that set up by bovine tubercle bacilli.

The exceptional result occurred with the culture derived from Virus P. XIV. (*see* table, pages 240–241), which gave rise in four calves to general tuberculosis, much less severe than that ordinarily produced by 50 milligrammes of bovine tubercle bacilli. A culture isolated from one of these calves was inoculated into two more calves, each in a dose of 50 milligrammes, and caused fatal general tuberculosis within the usual period. Apparently the culture from the original material, which was slightly though definitely less virulent than any bovine tubercle bacillus, became possessed of the full virulence of a bovine tubercle bacillus after a single passage through a calf.

The group from which human tubercle bacilli were isolated.

This group contains three viruses, P. IV., P. XLI., and P. XLVI., obtained from swine in which the disease was localised in the submaxillary glands. The cultures of these viruses grow much more luxuriantly on media containing glycerin than any of those in the preceding group and resemble closely the more easy growing cultures of human origin. They have a correspondingly low degree of virulence for the calf and rabbit, though one, Virus P. IV., appears to be slightly more virulent than the other two.

Virus P. XLI. and Virus P. XLVI. were inoculated subcutaneously each into two calves, the doses being 100 milligrammes and 50 milligrammes in one case, and 75 milligrammes and 50 milligrammes in the other. The calves were killed in from 98 to 105 days and each showed a local lesion and slight tuberculosis of the nearest glands only. A series of rabbits was inoculated with culture from each of the two viruses, intravenously, intraperitoneally and subcutaneously (pages 191–195): a few of the rabbits died prematurely, the rest increased in weight and when killed after periods varying from 99–174 days were found to have slight and non-progressive tuberculous lesions.

The culture of Virus P. IV. was inoculated subcutaneously into two calves in doses of 50 milligrammes and 34 milligrammes. The former, Calf 312, killed after a period of 90 days, showed a small fibrocaseous local lesion with caseation of the prescapular gland, tuberculous broncho-pneumonia of the dorsal parts of the caudal lobes of the lungs and several tubercles in the suprarenal bodies and in a few of the lymphatic glands. In the second calf, Calf 314, killed after 135 days, there was a cystic local lesion and caseation of the nearest glands, a tubercle in a mediastinal gland, and a few gritty foci in the mesenteric glands without any disease elsewhere. A third calf, Calf 350, was inoculated with the culture after it had been a longer period in cultivation (total period 183 days) in a dose of 50 milligrammes subcutaneously, and when killed after 90 days showed a cystic local tumour, caseation of the nearest glands and a few foci in the mediastinal and mesenteric glands without any disease elsewhere.

The culture from the original material of Virus P. IV. was also inoculated into a series of rabbits intravenously, intraperitoneally and subcutaneously (pages 191–195): one rabbit, inoculated intraperitoneally with a dose of 10 milligrammes died in 18 days of tuberculosis; another died of chronic general tuberculosis in 333 days after an intraperitoneal inoculation of 1·0 milligramme; the rest were killed after a period of about 90 days, and showed generalised tuberculosis rather more severe than that usually produced by a slightly virulent virus of human origin.

The virulence of these three viruses was tested also on the pig.

Two pigs, one, Pig 166, inoculated subcutaneously, the other, Pig 172, fed, each with 50 milligrammes of culture of Virus P. XLI. were killed after 102 and 98 days respectively: the animal that was fed showed only slight apparently retrogressive tuberculosis; the inoculated animal, Pig 166, had, in addition to local disease, a severe tuberculous broncho-pneumonic condition of the lungs with very little disease elsewhere.

From the lung of Pig 166 a culture was isolated directly and used to inoculate rabbits and a second pig, No. 202. Pig 202 received 50 milligrammes subcutaneously, and died after 64 days of tuberculous consolidation of the lungs, the condition being very similar to that in the first pig.

From the lung of Pig 202 an emulsion and a culture were made. The emulsion was inoculated subcutaneously into Pig 228, which was killed when well after 166 days, and showed slight non-progressive tuberculosis; the culture was inoculated into rabbits and into a third pig, No. 258.

Pig 258 was inoculated subcutaneously with 50 milligrammes of the culture, and died of tuberculous broncho-pneumonia in 103 days; from the lung a culture was isolated which was inoculated into rabbits.

This final culture, as well as the intermediate cultures, had only slight virulence for rabbits, and grew in the same luxuriant manner as the original culture.

This virus therefore exhibited higher virulence for the pig, though not for other animals, than the human tubercle bacillus, a virulence which was not increased by passage through the body of the pig

The other two viruses (P. XLVI. and P. IV.) displayed no higher virulence for the pig than the human tubercle bacillus.

Two pigs, Pig 164 inoculated subcutaneously, Pig 168 fed, each with 50 milligrammes of Virus P. XLVI. were killed after 97 and 60 days respectively, and showed only slight retrogressive tuberculosis.

The virulence of Virus P. IV. was tested on four pigs; one was inoculated and one fed with culture from the original material, and one inoculated and one fed with culture from Calf 312, the dose in each case being 1 milligramme. All were killed after about four months and showed slight retrogressive tuberculosis.

Cultures from each of the three viruses in this group have also been inoculated into guinea-pigs (subcutaneously and intraperitoneally) and into fowls (Virus P. IV. by feeding, Viruses P. XLI. and P. XLVI. intravenously). All the guinea-pigs developed fatal general tuberculosis: the fowls remained well and when killed were free from tuberculosis.

The group from which avian tubercle bacilli were isolated.

The five viruses, P. II., P. III., P. XXI., P. XXVII., and P. XLIV., included in this group were, like those in the preceding group, obtained from swine in which the disease was seemingly limited to the submaxillary glands.

Cultures, isolated in each case directly from the glands, exhibit marked differences from those in the first two groups and possess all the properties of the avian tubercle bacillus.

The cultures have been compared, as regards their virulence for animals and manner of growth on artificial media, with cultures of avian tubercle bacilli isolated from birds with natural tuberculosis and found to be identical.

The experiments with the different strains of avian tubercle bacilli are fully considered in a separate report. *See* Vol. IV. of this Appendix.

Mixed Virus.

In the case of Virus P. XLII. the culture isolated from a pig's submaxillary gland was at first considered to be a pure culture of the bovine tubercle bacillus ; a fourth subculture on glycerin agar showed, however, besides dry warty colonies a few shiny translucent colonies ; by repeated subculture and incubation at 42° C. a pure culture of the avian tubercle bacillus was separated.

The original culture caused fatal tuberculosis in rabbits and guinea-pigs identical with that produced by the bovine tubercle bacillus.

The avian culture was inoculated into two fowls and two guinea-pigs. Both fowls, one inoculated intraperitoneally, the other subcutaneously, died of general tuberculosis identical with that produced by cultures of avian tubercle bacilli derived from birds. One guinea-pig, No. 2489, inoculated subcutaneously with 200 milligrammes, showed merely a scar at the seat of inoculation when killed after 114 days ; the second, No. 2490, inoculated intraperitoneally with 1·0 milligramme, died in 80 days, and showed at the post-mortem examination softening of the sternal and portal glands and grey foci in the liver and kidneys ; the culture isolated from the sternal gland was typically avian.

VIRUSES FROM WHICH CULTURES WERE NOT OBTAINED.

Included under this head are Viruses P. XLVIII., XXVIII., XXXV., and XLV.

Virus P. XLVIII. was one of two received on the same day and obtained from a herd of swine, several of which had tuberculosis ; a rabbit inoculated intraperitoneally with an emulsion of the original material developed progressive general tuberculosis, but cultures were not obtained.

Virus P. XXVIII. was obtained from an old sow which had enlarged calcareous submaxillary glands with no sign of tuberculosis elsewhere ; although tubercle bacilli were fairly numerous direct cultures failed, and none of the animals (two rabbits and a guinea-pig) inoculated with an emulsion of the original material developed tuberculosis.

Cultures from Virus P. XXXV. also failed, nor did any of the animals (a rabbit and a guinea-pig) inoculated develop tuberculosis, although tubercle bacilli were fairly numerous in smear preparations from the original material.

Cultures from Virus P. XLV. failed through all the tubes becoming contaminated ; the rabbit inoculated from the original material died in 10 days from psorospermosis.

SUMMARY.

The material used in the investigation has been obtained from 63 cases of tuberculosis occurring naturally in swine ; in 21 of these the disease was apparently localised to the lymphatic glands (submaxillary and mesenteric) of the alimentary tract from which the material used for investigation was taken ; in 33 the disease was generalised ; in the remaining nine the condition of the rest of the body could not be ascertained with certainty.

In every animal in the series with two exceptions the disease appeared to be alimentary in origin. In these two cases, P. VI. and P. XVI., the condition of the glands in connection with the alimentary tract had not been ascertained.

Cultures have been isolated from 59 out of the 63 cases, either directly from the original material or through the guinea-pig ; the source of the culture was, in the majority of instances, the submaxillary glands (44), but cultures have been isolated from various metastatic lesions (15). From the remaining four cases cultures were not obtained.

The cultures from the 59 cases can be divided according to their cultural characters and virulence into three groups; in the first group there are 50 cultures which are identical with bovine tubercle bacilli with the exception of one, Virus P. XIV., which is definitely less virulent for calves and rabbits than any bacillus derived from a bovine source; the second group contains three, Viruses P. IV., P. XLI., and P. XLVI., which correspond to the slightly virulent tubercle bacillus of human origin (the human tubercle bacillus); in the third group there are five, Viruses P. II., P. III., P. XXI., P. XXVII., and P. XLIV., which exhibit all the characters of the avian tubercle bacillus.

From the remaining culture, Virus P. XLII., which was found to be a mixture, pure cultures of bovine and avian tubercle bacilli have been separated.

These figures cannot be taken as representing the relative frequency with which in nature swine tuberculosis is caused by the three types of tubercle bacilli mentioned, since, as stated in the introduction, some amount of selection was exercised in obtaining material.

A consideration of the extent of the disease in relation to the type of bacillus isolated shows that in none of the swine from which either human tubercle bacilli or avian tubercle bacilli in pure culture were obtained was there evidence of generalised tuberculosis, the disease in every instance being localised in the submaxillary glands.

When the tuberculosis is slight in extent and limited to the submaxillary glands, it is impossible from the appearance of the lesions alone to decide what particular type of bacillus produced it. This will be seen from a comparison of the descriptions of the original material of the viruses from which the avian and human tubercle bacilli were isolated with those of Viruses P. XXXVIII., P. XXXIX., P. XLIII., and P. XLVII., from which bovine tubercle bacilli were obtained.

Out of the total number of 50 swine from which bovine tubercle bacilli were isolated, 32 showed generalised tuberculosis, in 9 the tuberculosis was regarded as localised, and in 9 no details as to the condition of the rest of the carcasses could be obtained.

CONCLUSIONS.

1. Natural tuberculosis in swine may be the result of infection either with the bovine tubercle bacillus, the human tubercle bacillus, or the avian tubercle bacillus.
2. The bovine tubercle bacillus is the most common cause of tuberculosis in swine and has been found in every case in this series where there was disseminated tuberculosis, as well as in more than half (10 out of 18) of those in which, so far as could be ascertained, the disease was localised.
3. The tuberculous lesions in the pig's lymphatic glands caused by the human tubercle bacillus or the avian tubercle bacillus cannot be distinguished from the lesions sometimes produced by the bovine tubercle bacillus.

F. Griffith.

A. Stanley Griffith.

TABLE OF ORIGINS OF PORCINE VIRUSES.

VIRUSES OF PORCINE ORIGIN.

Designation of Virus.	Source.	Date of Receipt of Virus.	Description of Animal and Lesions.	Tissue used for Experiment.	Animals Inoculated.	Classification of Virus according to Cultural Characters and Virulence.
P. I.	Metropolitan Cattle Market.	March 3, 1905	The material received was from a sow about twelve months old. It consisted of the right submaxillary glands, which were severely affected, and of inguinal glands showing one nodule. It was stated that the lungs were also slightly affected One submaxillary gland (from which the cultures were made) was enlarged and composed throughout of calcareo-caseous substance. The other submaxillary glands contained large calcareo-caseous nodules.	Submaxillary Gland.	Rabbits and Guinea-pigs only.	Bovine.
P. II.	Metropolitan Cattle Market.	March 9, 1905	The material was obtained from a young pig about six months old reported to have shown no sign of disease elsewhere. The specimens received were two submaxillary glands not apparently enlarged but showing on section fine caseous streaks and foci. A smear from one of the glands showed moderate numbers of tubercle bacilli.	Submaxillary Gland.	1 Calf, 4 Pigs, 2 Goats, 4 Monkeys, 2 Cats, Fowls, Rabbits, Guinea-pigs, and Rats.	Avian.
P. III.	Metropolitan Cattle Market.	March 10, 1905	Submaxillary glands from a pig about six months old reported to have shown no sign of disease elsewhere. These glands showed on section coarse streaks of caseation in the centre of which signs of early calcification were observed. A few tubercle bacilli were found in a smear from one of the glands.	Submaxillary Gland.	2 Calves, 1 Pig, 1 Monkey, 4 Cats, 1 Dog, Fowls, Rabbits, Guinea-pigs, and Rats.	Avian.
P. IV.	Metropolitan Cattle Market.	March 21, 1905	The specimens received were the submaxillary glands from a pig about seven months old which was reported to have shown no sign of tuberculosis elsewhere. The glands, not enlarged, contained isolated discrete caseo-calcareous tubercles embedded in normal gland tissue.	Submaxillary Gland.	6 Calves, 4 Pigs, 1 Cat, 1 Dog, 1 Fowl, Rabbits, Guinea-pigs, and Rats.	Human (Group II).
P. V.	Metropolitan Cattle Market.	April 18, 1905	Specimens received were the submaxillary and bronchial glands from a sow. It was stated that the inguinal glands were tuberculous, the lungs pneumonic, and the joints enlarged. The submaxillary glands contained gritty cheesy nodules; a bronchial gland a single nodule of similar character.	Submaxillary Gland and Bronchial Gland.	1 Calf, Rabbits, Rats, Guinea-pigs.	Bovine.

P. VI.	Metropolitan Cattle Market.	April 28, 1905	Udder and inguinal glands of an old sow with tuberculosis of the lungs. The piece of udder and the glands contained firm yellow caseous nodules, slightly gritty from calcification.	Inguinal Gland.	1 Calf, Rabbits, Guinea-pigs.	Bovine.
P. VII.	Metropolitan Cattle Market.	April 28, 1905	A tuberculous submaxillary gland of a young sow the subject of general tuberculosis. The submaxillary gland submitted for investigation was very large; on section it was composed throughout of caseo-necrotic tissue softened and broken down chiefly around the periphery, and surrounded by a fibrous wall.	Submaxillary Gland.	Rabbits and Guinea-pigs only.	Bovine.
P. VIII.	Metropolitan Cattle Market.	May 11, 1905	The specimens received were from a young pig, fat and in good condition. Two submaxillary glands, one the size of a Tangerine orange, the other half that size, were indurated, and showed on section firm grey translucent caseating tissue. The lungs were beset with discrete nodules, ranging in size from a pin's head to that of a small pea; these were greyish red at the margins, caseous in the centre. Mesenteric glands normal.	Submaxillary Gland.	1 Calf, Rabbits, Guinea-pigs.	Bovine.
P. IX.	Metropolitan Cattle Market.	May 18, 1905	The specimens received were the submaxillary and sublumbar glands from a young sow. The submaxillary glands were enlarged and fibroid, showed on section firm masses and irregular streaks of caseation distinctly gritty from calcification. The lumbar glands contained caseous tubercles. The lungs were affected. A few tubercle bacilli were found in a smear from one of the submaxillary glands.	Submaxillary Gland.	1 Calf, Rabbits, Guinea-pigs.	Bovine.
P. X.	Metropolitan Cattle Market.	May 18, 1905	The specimens received were mesenteric glands, lung and udder, from an old sow. The mesenteric glands contained softened caseous tubercles, very slightly gritty from calcification; in some of the glands the tubercles were discrete; in others confluent. The piece of lung showed softened caseous nodules, the largest the size of a pea; these were also very slightly gritty. The udder was normal. No tubercle bacilli were seen in an emulsion made from a mesenteric gland.	Mesenteric Gland.	Rabbits and Guinea-pigs only.	Bovine.
P. XI.	Metropolitan Cattle Market.	June 1 1905	The material received was from a young pig affected with general tuberculosis. The submaxillary glands were enlarged, caseous practically throughout and beginning to soften. The mesenteric glands were normal. The lungs contained sparsely scattered miliary caseous tubercles; the liver a few small tubercles, some caseous; the spleen about 8 nodules ranging from 2 to 10 mm. in diameter, caseous in the centre.	Submaxillary Gland.	1 Calf, Rabbits, Guinea-pigs.	Bovine.

VIRUSES OF PORCINE ORIGIN—*continued.*

Designation of Virus.	Source.	Date of Receipt of Virus.	Description of Animal and Lesions.	Tissue used for Experiment.	Animals Inoculated.	Classification of Virus according to Cultural Characters and Virulence.
P. XII.	Metropolitan Cattle Market.	June 26, 1905	The specimen received was a submaxillary gland of a young pig. The gland was enlarged, caseous and softened almost throughout; the caseous material contained gritty particles. Moderate numbers of tubercle bacilli were found in a smear from the gland. There was no statement as to absence of disease elsewhere.	Submaxillary Gland.	3 Calves, Rabbits, Fowls, and Guinea-pigs.	Bovine.
P. XIII.	Metropolitan Cattle Market.	July 6, 1905	The specimens received were the submaxillary and bronchial glands of a young pig, the lungs of which were reported to be slightly affected. The submaxillary glands were enlarged, caseating throughout and very gritty from calcification; one of the glands was partly broken down, containing thick greenish-pus. The bronchial glands were enlarged and closely beset with irregular caseo-calcareous tubercles.	Submaxillary Gland.	Rabbits and Guinea-pigs only.	Bovine.
P. XIV.	Metropolitan Cattle Market.	July 13, 1905	The specimens received were submaxillary and inguinal glands and portions of lung of a young pig. Two submaxillary glands were closely beset with slightly gritty caseous foci; two inguinal glands contained each a small softened caseous nodule. The lung contained numerous nodules ranging in size from a pin's head to a small pea; the nodules were soft caseous and slightly gritty and had thin fibrous capsules.	Submaxillary Gland.	6 Calves, Rabbits, Guinea-pigs, Fowl, and Rats.	Bovine.
P. XV.	Metropolitan Cattle Market.	August 1, 1905	The specimens received were two submaxillary and two inguinal glands and part of the spleen of a young sow. The lungs of this animal were reported as not affected, but the right shoulder was enlarged and regarded as tuberculous. One of the submaxillary glands the size of a pigeon's egg was caseo-calcareous throughout and softened in the centre; the other showed caseous streaks and points in a firm translucent tissue. The inguinal glands each contained small caseous nodules. In the spleen there were numerous nodules varying in size from a pin's head to that of a pea, translucent, with caseous centres.	Submaxillary Gland.	Rabbits, Guinea-pigs, and Rats.	Bovine.

P. XVI.	Metropolitan Cattle Market.	August 14, 1905	The specimens received were three bronchial glands and a piece of the lung of a pig. The glands were apparently enlarged and contained a few gritty caseous nodules; the piece of lung was not affected.	Bronchial Gland	Rabbits and Guinea-pigs only.	Bovine.
P. XVII.	Metropolitan Cattle Market.	August 14, 1905	The specimens received were the lungs. bronchial glands and two mesenteric glands of a pig. The lungs and bronchial glands were not affected. One mesenteric gland was caseo-calcareous throughout; the other was partly caseo-calcareous; both glands were beginning to soften.	Mesenteric Gland	Rabbits and Guinea-pigs only.	Bovine.
P. XVIII.	Metropolitan Cattle Market.	August 14, 1905	The specimens received were two mesenteric glands, a piece of lung and the bronchial glands of a pig. The mesenteric glands contained sparsely scattered yellow gritty foci. The piece of lung was quite solid: about half was yellow, caseous and softened: the rest was composed of firm grey tissue with pea-sized nodules embedded in it. One bronchial gland contained numerous yellow caseous foci; another contained a yellow gritty nodule, 2 mm. in diameter; two others were normal.	Lung	Rabbits and Guinea-pigs only.	Bovine.
P. XIX.	Metropolitan Cattle Market.	August 14, 1905	Two small tuberculous submaxillary glands of a pig were received. They contained a few yellow caseous gritty foci. No details as to the condition of the rest of the body were given.	Submaxillary Gland.	Rabbits, Guinea-pigs, and Rats.	Bovine.
P. XX.	Metropolitan Cattle Market.	November 30, 1905	The specimens received were the submaxillary and inguinal glands of a sow about 14 months old. Two submaxillary glands, each the size of a pheasant's egg, were composed throughout of gritty caseous material beginning to soften; some other glands were partly caseous or contained hard caseous nodules. The inguinal glands contained two small caseous tubercles.	Submaxillary Gland.	Rabbits and Guinea-pigs only.	Bovine.

VIRUSES OF PORCINE ORIGIN—*continued.*

Designation of Virus.	Source.	Date of Receipt of Virus.	Description of Animal and Lesions.	Tissue used for Experiment.	Animals Inoculated.	Classification of Virus according to Cultural Characters and Virulence.
P. XXI.	Metropolitan Cattle Market.	December 4, 1905	The specimens received were the submaxillary, inguinal and mesenteric glands, and the lung from a young boar condemned for pleurisy. The submaxillary gland was perhaps slightly enlarged and contained discrete caseous miliary tubercles, slightly gritty from calcification. collected together in one place into a nodule the size of a pea; the tubercles readily shelled out from the surrounding gland tissue which was normal in appearance. Numerous tubercle bacilli were seen in an emulsion made from the submaxillary gland. The inguinal and mesenteric glands and the lung showed no sign of tuberculosis.	Submaxillary Gland.	1 Calf, 1 Dog, 3 Monkeys, Fowls, Rabbits, Guinea-pigs, and Rats.	Avian.
P. XXII.	Metropolitan Cattle Market.	September 29, 1905	The pig which furnished the specimens was about seven months old, and was in good condition. The submaxillary glands were greatly enlarged and consisted throughout of dense caseating tissue appreciably gritty from calcification. No tubercle bacilli were seen in a smear from one of these glands. A dorsal mediastinal gland, the size of a pigeon's egg, was in a similar condition but was perhaps more gritty. The lung contained fairly numerous yellow calcareous miliary tubercles.	Submaxillary Gland.	Rabbits and Guinea-pigs.	Bovine.
P. XXIII.	Metropolitan Cattle Market.	September 27, 1905	The specimens received were the submaxillary and bronchial glands and a portion of the lung of a pig about 7 months old, in good condition. Two submaxillary glands showed on section calcareo-caseous streaks. The bronchial glands were moderately enlarged, very dense, and closely infiltrated with irregular calcareo-caseous streaks. No tubercle bacilli were seen in a smear from one of the bronchial glands. The piece of lung contained several large nodules, up to the size of a marble, with grey margins and soft caseous centres; there were also several smaller nodules with opaque caseous centres.	Bronchial Gland.	Rabbits and Guinea-pigs only.	Bovine.
P. XXIV.	Metropolitan Cattle Market.	December 8, 1905	The material received was from a young boar, the carcass of which was in good condition and was condemned. The submaxillary glands were enlarged and beset with caseous slightly gritty tubercles, in many places aggregated together to form large nodules with a mulberry-like outline; the tubercles could be readily shelled out from the surrounding gland tissue. A few tubercle bacilli were seen in a smear made from one of the glands. The bronchial and mesenteric glands contained scattered discrete caseous tubercles. The inguinal glands, lung, liver and spleen were normal.	Submaxillary Gland.	Rabbits and Guinea-pigs only.	Bovine.

P. XXV.	Metropolitan Cattle Market.	December 8, 1905	The specimens, the submaxillary and inguinal glands, were from the carcass of a young pig about 8 months old. The submaxillary glands were much enlarged, indurated, smooth and rounded externally; on section they were composed of translucent gland-like tissue containing necrotic patches and an irregular necrotic network; the patches had a greyish-white translucent appearance and showed in the centre opaque white streaks (?) of beginning calcification. Moderate numbers of tubercle bacilli were seen in a smear from one of the glands. The inguinal glands were normal.	Submaxillary Gland.	Rabbits and Guinea-pigs only.	Bovine.
P. XXVI.	Metropolitan Cattle Market.	December 8, 1905	The specimens received were two enlarged submaxillary glands and inguinal glands. One submaxillary gland was caseous and softened throughout and surrounded by a thick fibrous capsule; the other was firm and showed a softened caseous gritty mass and numerous discrete miliary caseous tubercles. Two tubercle bacilli were seen in a smear from one of the glands. The inguinal glands were normal.	Submaxillary Gland.	Rabbits and Guinea-pigs only.	Bovine.
P. XXVII.	Metropolitan Cattle Market.	December 11, 1905	The specimens received were the submaxillary glands from a pig the carcass of which had been condemned for pleurisy. It was stated that there was no sign of tuberculosis in any part of the body with the exception of the submaxillary glands. These glands showed on section opaque whitish irregular slightly gritty caseous tubercles, mostly discrete, but here and there collected together into small groups. Numerous tubercle bacilli were seen in a smear from one of the glands.	Submaxillary Gland.	2 Calves, 1 Pig, 1 Monkey, Fowls, Rabbits, and Guinea-pigs.	Avian.
P. XXVIII.	Metropolitan Cattle Market.	December 20, 1905	Submaxillary glands from a fat sow, about two years old, killed on December 19th, 1905. The glands, five in number, each about the size of a thrush's egg, were stony hard and nodular on the surface; on section they were composed of dry, mortar-like calcareo-caseous material surrounded by a thin capsule of fibrous tissue. It was stated that there was no sign of disease in any other part of the body. A few tubercle bacilli were seen in an emulsion made from one of the glands.	Submaxillary Gland.	Rabbits and Guinea-pigs.	No culture isolated.
P. XXIX.	Metropolitan Cattle Market.	December 20, 1905	The material received, a submaxillary gland, was from a young pig reported as the subject of general tuberculosis. The gland was greatly enlarged, indurated, and showed on section a coarse, caseous network, slightly gritty from calcification; the tissue in the interstices of the network was grey and translucent. A smear from the gland showed fairly numerous tubercle bacilli.	Submaxillary Gland.	1 Calf, Rabbits, and Guinea-pigs.	Bovine.

VIRUSES OF PORCINE ORIGIN—*continued.*

Designation of Virus.	Source.	Date of Receipt of Virus.	Description of Animal and Lesions.	Tissue used for Experiment.	Animals Inoculated.	Classification of Virus according to Cultural Characters and Virulence.
P. XXX.	Metropolitan Cattle Market.	December 20, 1905	The specimens received were two submaxillary glands of a young pig reported as the subject of general tuberculosis. These glands were moderately enlarged and showed the substance irregularly caseated; there was no calcification. A smear from one of the glands showed fairly numerous tubercle bacilli.	Submaxillary Gland.	Rabbits and Guinea-pigs.	Bovine.
P. XXXI.	Metropolitan Cattle Market.	December 20, 1905	The material, a submaxillary gland, was from a young pig reported as the subject of general tuberculosis. The gland was very large, hard, and showed on section practically the whole of its substance composed of dense. waxy, translucent tissue, penetrated with fine whitish streaks of calcification. In a smear from the gland fairly numerous tubercle bacilli were found.	Submaxillary Gland.	Rabbits and Guinea-pigs.	Bovine.
P. XXXII.	Metropolitan Cattle Market.	February 12, 1906	The specimens received were the submaxillary glands from a pig about six months old, the carcass of which was condemned. One of the glands was the size of a pheasant's egg and was caseous and softened throughout; the other glands were smaller and showed varying amounts of caseation; the caseated tissue in the latter glands was firm, gritty and not softened.	Submaxillary Gland.	Rabbits and Guinea-pigs.	Bovine.
P. XXXIII.	Metropolitan Cattle Market.	February 15, 1906	The specimens received were the submaxillary glands of a young pig six months old. It was stated that there was no tuberculosis elsewhere in this animal. A gland from one side of the neck, the size of a pheasant's egg, was caseo-necrotic throughout and beginning to soften. A smaller gland showed discrete tubercles. The lesions were just perceptibly gritty. A smear from one of the glands showed very few tubercle bacilli. The glands on the opposite side were normal.	Submaxillary Gland.	Rabbits and Guinea-pigs.	Bovine.
P. XXXIV.	Metropolitan Cattle Market.	February 17, 1906	The specimens received were the submaxillary glands and lung of a pig six months old. One submaxillary gland was enlarged, caseous and softened throughout, and slightly gritty; another smaller gland was partly caseous. Very few tubercle bacilli were found in a smear from one of the glands. The lung contained scattered softened caseous nodules up to 2 mm. with translucent grey margins.	Submaxillary Gland.	Rabbits and Guinea-pigs.	Bovine.

P. XXXV.	Metropolitan Cattle Market.	March 9, 1906	The specimens received were submaxillary glands from a pig about six months old. It was stated that there was no sign of tuberculosis elsewhere in the body. These glands were a little enlarged and firmer than normal, and showed on section irregular yellow necrotic streaks, some coarse, others fine. There was no calcification. A smear from one of the glands showed tubercle bacilli in moderate numbers.	Submaxillary Gland.	Rabbit and Guinea-pig.	No culture isolated.
P. XXXVI.	Metropolitan Cattle Market.	March 24, 1906	The specimens received were the submaxillary glands and portion of lung of a pig about ten months old. It was stated that there was no tuberculosis elsewhere in this animal. The submaxillary glands were fused together forming a mass nearly the size of a goose's egg. On section they were composed throughout of friable caseo-necrotic tissue, slightly gritty from calcification. The piece of lung was almost entirely consolidated, and was pinkish and translucent; no tubercles were seen in it.	Submaxillary Gland.	Rabbits and Guinea-pigs.	Bovine.
P. XXXVII.	Metropolitan Cattle Market.	March 24, 1906	The specimens received were the submaxillary glands, a bronchial gland and portion of lung from a pig about ten months old. The submaxillary glands were fused together (capsules adherent) forming a large firm mass the size of a goose's egg; on section they were composed throughout of pinkish necrotic tissue with white calcareous lines; the capsules were greatly thickened. The piece of lung was solid and pinkish grey; no tuberculous nodules seen in it. The bronchial gland showed small patches of early caseation.	Submaxillary Gland.	Rabbits and Guinea-pigs.	Bovine.
P. XXXVIII.	Metropolitan Cattle Market.	May 15, 1906	The specimens received were submaxillary glands, one from each side of the neck, of a young pig. It was stated that there was no tuberculosis elsewhere. In the centre of one gland there was a pea-sized caseous nodule, the rest of the gland containing scattered minute yellowish foci. A few tubercle bacilli were found in a smear made from it. The other gland was small and was not affected.	Submaxillary Gland.	Rabbits and Guinea-pigs.	Bovine.
P. XXXIX.	Metropolitan Cattle Market.	May 15, 1906	The specimen was the submaxillary gland of a young pig, the lungs of which were reported to have been slightly affected. The gland was uniformly infiltrated with irregular gritty tubercles the size of millet seeds. At one corner of the gland the tubercles had fused together forming a projecting nodule the size of a split pea. No tubercle bacilli were seen in a smear from the gland.	Submaxillary Gland.	Rabbits and Guinea-pigs.	Bovine.
P. XL.	Metropolitan Cattle Market.	May 15, 1906	The specimens received were the tuberculous submaxillary glands of a young pig, the lungs of which were reported to have shown slight tuberculosis though no disease was found anywhere else in the body. Two submaxillary glands, each the size of a pheasant's egg, were fused together. On section one caseating gritty nodule was seen, the glands being elsewhere composed of gland-like tissue with fine caseous streaks. A smear made from one of the glands showed tubercle bacilli in moderate numbers.	Submaxillary Gland.	Rabbits, Guinea-pigs, and Fowl.	Bovine.

VIRUSES OF PORCINE ORIGIN—*continued*

Designation of Virus.	Source.	Date of Receipt of Virus.	Description of Animal and Lesions.	Tissue used for Experiment.	Animals Inoculated.	Classification of Virus according to Cultural Characters and Virulence.
P. XLI.	Metropolitan Cattle Market.	May 24, 1906	The specimens received were the submaxillary glands of a young pig about five months old. These glands were not enlarged, and contained caseous gritty tubercles and nodules; the larger nodules (the size of small peas) were formed by aggregated tubercles. A smear from one of the glands showed moderately numerous tubercle bacilli. It was stated that no tuberculosis was seen elsewhere in the body.	Submaxillary Glands.	2 Calves, 5 Pigs, 2 Fowls, Rabbits, and Guinea-pigs.	Human (Group II.)
P. XLII.	Metropolitan Cattle Market.	May 24, 1906	The specimens received were the submaxillary glands from a young pig about eight months old. The lungs and liver were stated to have been very slightly affected. One submaxillary gland, the size of a marble, was caseous throughout, slightly gritty, and beginning to soften. No tubercle bacilli were found in a smear from this gland. Other glands were normal.	Submaxillary Gland.	Rabbits, Guinea-pigs, and Fowls.	Bovine. (Avian bacilli also isolated.)
P. XLIII.	Metropolitan Cattle Market.	June 11, 1906	The specimens received were the submaxillary and inguinal glands of a young sow of which it was reported that no tuberculosis was seen elsewhere in the body. Three of the former glands were enlarged, the size of filberts, and contained discrete yellowish-white tubercles and foci, the majority of which were only calcareous grains. Several other glands were normal. Three smears were made from the submaxillary glands; in one a single tubercle bacillus was found. The inguinal glands were normal.	Submaxillary Glands.	Rabbits and Guinea-pigs.	Bovine.
P. XLIV.	Metropolitan Cattle Market.	June 29, 1906	The specimens received were the submaxillary glands. They were normal in size and showed on section scattered irregular opaque whitish caseous foci up to 1·5 mm. in diameter. A few tubercle bacilli were seen in smears from the glands. It was stated of this pig that no tuberculosis was seen elsewhere in the body.	Submaxillary Glands.	1 Calf, Rabbits, Guinea-pigs, and Fowls.	Avian.
P. XLV.	Metropolitan Cattle Market.	July 2, 1906	The specimens received were the submaxillary glands of a pig, about 12 months old. They were slightly enlarged and moderately closely beset with firm caseous nodules, from a millet seed to a pea in size, which could be readily shelled out of the gland tissue. Six tubercle bacilli were found in a smear from one of the glands. It was stated that no tuberculosis was seen elsewhere in the body.	Submaxillary Glands.	1 Rabbit.	No culture obtained.

P. XLVI.	Metropolitan Cattle Market.	July 2, 1906	The specimens received were the submaxillary glands from a pig about 12 months old. They were not apparently enlarged, and contained scattered discrete caseous gritty nodules up to a hempseed in size; some of the larger ones were softened. Ten tubercle bacilli were found in a smear from one of the glands. It was stated that no tuberculosis was seen elsewhere in the body.	Submaxillary Glands.	2 Calves, 2 Pigs, Rabbits, and Guinea-pigs.	Human (Group II.)
P. XLVII.	Metropolitan Cattle Market.	July 2, 1906	The specimens received were two submaxillary glands from a pig about 12 months old. The glands were not apparently enlarged, but were firmer than normal, and beset with irregular yellow necrotic foci which could not be shelled out. No tubercle bacilli were found in a smear from one of the glands. It was stated that no tuberculosis was seen elsewhere in the body.	Submaxillary Glands.	Rabbits and Guinea-pigs.	Bovine.
P. XLVIII.	Metropolitan Cattle Market.	July 2, 1906	The specimens received were the submaxillary glands from a young pig about 12 months old. They were enlarged and showed on section an irregular coarse caseo-calcareous network embedded in a fibrous matrix. A smear from one of the glands showed numerous tubercle bacilli. It was stated that no tuberculosis was seen elsewhere in the body.	Submaxillary Glands.	Rabbit and Guinea-pig.	No culture isolated.
P. XLIX.	Metropolitan Cattle Market.	August 15, 1906	The specimen received was the submaxillary gland of a young pig, one of six, out of a drove of ten, which were found to be tuberculous. The gland was moderately enlarged and showed on section firm whitish gritty caseous patches and discrete caseous gritty tubercles. No tubercle bacilli were seen in a smear from the gland. It was stated that no tuberculosis was seen elsewhere in the body.	Submaxillary Gland.	Rabbits and Guinea-pigs.	Bovine.
P. L.	Metropolitan Cattle Market.	August 15, 1906	The specimen received was the submaxillary gland of a young pig, another of the six animals mentioned above. The gland was enlarged, dense, and partly composed of dense caseo-calcareous substance, and elsewhere closely beset with discrete caseous gritty tubercles. A smear from the gland showed a few tubercle bacilli. It was stated that there was no tuberculosis elsewhere in the body.	Submaxillary Gland.	Rabbits and Guinea-pigs.	Bovine.
P. LI.	Metropolitan Cattle Market.	October 15, 1906	The specimens received were the submaxillary and inguinal glands from a pig about 12 months old, one of eight, out of a drove of eleven, which were found to be tuberculous. Two submaxillary glands were enlarged, one was caseo-calcareous throughout, the other contained discrete caseo-calcareous nodules and tubercles the remaining gland substance being fibroid. A third small gland contained a few caseous tubercles. The inguinal glands were normal. It was stated that no tuberculosis was seen elsewhere in the body.	Submaxillary Glands.	Rabbits and Guinea-pigs.	Bovine.

VIRUSES OF PORCINE ORIGIN—*continued*.

Designation of Virus.	Source.	Date of Receipt of Virus.	Description of Animal and Lesions.	Tissues used for Experiment.	Animals Inoculated.	Classification of Virus according to Cultural Characters and Virulence.
P. LII.	Metropolitan Cattle Market.	October 15, 1906	The specimens received were the submaxillary and inguinal glands from a young pig about 12 months old, another of the eight animals mentioned above. Of four submaxillary glands from one side of the neck, three contained discrete caseo-calcareous tubercles, the fourth a pea-sized caseo-calcareous nodule. The glands from the other side were fused together into a mass the size of a pheasant's egg, which was on section almost entirely caseo-calcareous. The inguinal glands were normal. It was stated that no tuberculosis was seen elsewhere in the body.	Submaxillary Glands.	Rabbits and Guinea-pigs.	Bovine.
P. LIII.	Metropolitan Cattle Market.	January 11, 1907	The specimens received were the submaxillary and inguinal glands of a young pig about six months old, one of a herd of 30, 16 of which were found to be tuberculous. The submaxillary glands from either side of the neck were enlarged. They were firm and infiltrated with translucent nodules forming a coarse network with irregular caseo-calcareous streaks in the centres. The inguinal glands were normal.	Submaxillary Glands.	Rabbits, Guinea-pigs, and 1 Fowl.	Bovine.
P. LIV.	Metropolitan Cattle Market.	January 11, 1907	The specimens received were the submaxillary and inguinal glands from a young pig about six months old out of the same herd as the above. The submaxillary glands were enlarged and their substance almost entirely replaced by firm translucent tissue containing a caseo-calcareous network. The inguinal glands were normal.	Submaxillary Glands.	Rabbits, Guinea-pigs, and 1 Fowl.	Bovine.
P. LV.	Metropolitan Cattle Market.	January 11, 1907	The specimens received were the submaxillary and inguinal glands from another six months old pig from the same herd as the above. One large submaxillary gland the size of a hen's egg was firm, and composed of translucent tissue with a close network of caseo-calcareous tissue. Two smaller glands were normal. The inguinal glands were normal.	Submaxillary Glands.	Rabbits and Guinea-pigs.	Bovine.
P. LVI.	Metropolitan Cattle Market.	April 19, 1907	The specimens received were a piece of lung, mesenteric glands, and left fore knee joint, taken from a boar about two years old. The lung contained discrete soft caseous gritty nodules up to 6 mm. in diameter. In the mesenteric glands there were a few miliary calcareous tubercles. The knee joint was ankylosed and formed a rounded mass 5 inches in diameter; in the skin there were several small ulcers over soft caseous nodules, and in the centre of the joint there was a mass of caseo-purulent substance.	Subcutaneous Nodule.	Rabbits and Guinea-pigs.	Bovine.

P. LVII.	Metropolitan Cattle Market.	May 16, 1907	The specimens received were the submaxillary, bronchial, mesenteric, and lumbar glands, and pieces of lung from a young sow. The submaxillary glands were large and extensively caseo-calcareous. The bronchial glands were closely beset with calcareo-caseous nodules, and the mesenteric and lumbar glands contained a few. The lung showed scattered fibroid nodules with soft caseous centres. It was stated that the liver also contained a few tubercles and that the spleen was normal.	Bronchial Gland.	Rabbits and Guinea-pigs.	**Bovine.**
P LVIII.	Metropolitan Cattle Market.	May 27, 1907	The specimens received were from a young sow. The submaxillary glands were caseo-necrotic throughout and slightly gritty. The liver and spleen were beset with caseo-calcareous tubercles up to a millet seed in size. The inguinal glands were large, fibroid and extensively caseated. The mammary gland was beset with soft caseous gritty nodules separated by fibrous tissue.	Mammary Gland.	Rabbits and Guinea-pigs.	Bovine.
P. LIX.	Birmingham.	June 5, 1907	The material received was the synovial membrane from the elbow joint and the submaxillary glands of a pig the carcass of which was stated to have shown tuberculosis of the lungs and all the organs. The submaxillary glands were represented by a mass of caseo-calcareous tissue partly softened. The synovial membrane was closely filled with nodules varying up to a pea in size: the largest consisted of caseous gritty substance enclosed within thin translucent capsules.	Synovial Membrane.	Rabbits and Guinea-pigs.	Bovine.
P. LX.	Birmingham.	June 5, 1907	The specimens received were the submaxillary, bronchial and inguinal glands and spleen from a case of general tuberculosis in a young pig. The submaxillary glands were caseo-calcareous throughout; the bronchial and inguinal glands were similarly affected. In the spleen there were discrete grey nodules with caseous gritty centres varying in size from a millet seed up to that of a large pea.	Spleen.	Rabbits and Guinea-pigs.	Bovine.
P. LXI.	Birmingham.	June 27, 1907	The material received was from a pig stated to be affected with general tuberculosis. The submaxillary glands were enlarged and composed of pinkish caseo-necrotic tissue with calcareous streaks. The bronchial and portal glands were large and caseo-calcareous throughout. The liver contained discrete caseo-calcareous miliary tubercles.	Bronchial Gland.	Rabbits and Guinea-pigs.	Bovine.
P. LXII.	Birmingham.	June 27, 1907	The specimens received were from a pig stated to be affected with general tuberculosis. The submaxillary glands were caseo-necrotic throughout. The spleen and lungs contained numerous soft caseous nodules. There were caseo-calcareous nodules in the lumbar glands.	Spleen.	Rabbits and Guinea-pigs.	Bovine.

VIRUSES OF PORCINE ORIGIN—*continued.*

Description of Virus.	Source.	Date of Receipt of Virus.	Description of Animal and Lesions.	Tissues used for Experiment.	Animals Inoculated.	Classification of Virus according to Cultural Characters and Virulence.
P. XLIII.	Birmingham.	July 19, 1907	The specimens received were the submaxillary, bronchial and supramammary lymphatic glands, the liver, portions of ribs and dorsal vertebrae. The submaxillary glands showed a few opaque foci and small caseo-calcareous tubercles. The bronchial glands were enlarged and caseo-calcareous throughout. The supramammary glands contained caseous nodules. In the liver there were numerous caseous nodules with gritty centres varying up to a pea in size. In the shaft of a rib there was a large caseating nodule and there were several large caseous masses at the heads of the ribs extending into the costo-vertebral articulations.	Rib.	Rabbits and Guinea-pigs.	Bovine.

CULTURAL CHARACTERS OF, AND GENERAL RESULTS OF INOCULATION EXPERIMENTS WITH TUBERCLE BACILLI OF PORCINE ORIGIN.

CULTURAL CHARACTERS OF TUBERCLE BACILLI OF PORCINE ORIGIN.

The following routine method, described more fully in the report on the bovine tubercle bacillus, (Second Interim Report, Appendix, Vol. III., Page 3), has been adopted for the determination of the cultural characters of a particular strain of tubercle bacilli.

The culture isolated from the animal body on the egg medium is maintained on pure serum, and is subcultivated for several generations until it grows readily on this medium. Then from a subculture about seven to ten days old inoculations are made on to the differential media. These consist of serum, serum with 5 per cent. glycerin added, 5 per cent. glycerin agar, glycerinated potato, and 2 per cent. glycerin broth with or without gelatin. Observations are made every seven days on the rate and the characters of the growth on each particular medium until about the end of the sixth week, and are recorded together with a description of the final growth.

The result of this investigation has been to demonstrate that from tuberculous lesions in swine it is possible to isolate cultures of tubercle bacilli, which, according to the character of the growth on media containing glycerin, can be divided into three main groups. The experimental inoculation of animals has shown further that the bacilli in these groups manifest well-marked differences in virulence.

This report deals with the cultural characters of 59 strains of tubercle bacilli isolated from swine.

The cultures of 50 of the viruses are identical with tubercle bacilli derived from bovine animals both in their cultural characters and in their virulence for animals, and will be described in detail under the heading of virulent porcine tubercle bacilli.

Three of the cultures grow more luxuriantly than any bovine culture, resembling those most commonly found in man, and are designated slightly virulent porcine tubercle bacilli (i.e. the human tubercle bacillus.)

Of the remaining six cultures five are avian in character, and are described fully in another report, together with other avian cultures derived from birds.

The last culture (Virus P. XLII.) contained two elements, virulent mammalian tubercle bacilli (bovine tubercle bacilli) and avian tubercle bacilli, which were separated by appropriate methods.

Virulent Porcine Tubercle Bacilli.

The great majority of tubercle bacilli obtained from swine falls into this group. So exactly do they resemble in all their reactions tubercle bacilli isolated from bovines that there can be no doubt but that the lesions from which they were obtained were caused by the bovine tubercle bacillus. These virulent porcine tubercle bacilli, like the bovine tubercle bacilli, can be divided roughly into three classes according to their capacity for growing on the test media containing glycerin.

Class 1.

The viruses in this class, 25 in number, grow with the most difficulty, and vary very little among themselves; they are distinguished by the initial delay in growing on media containing glycerin, a feature which they retain after prolonged cultivation on pure serum.

Viruses.	Cultural Characters.
P.I., V.,XVI., XVII., XVIII., XIX., XXII., XXIII., XXVI., XXIX., XXXI., XXXIII., XXXIV., XXXVI., XXXVII., XL., XLVII., XLIX., L., LI., LII., LVI., LVII., LIX., LX.	On pure serum they produce a dry, usually even grey layer which does not increase after the second or third week: on the same serum with the addition of 5 per cent. glycerin no growth occurs during the first week, but in the second or third weeks discrete colonies appear which may subsequently coalesce, forming a rough warty, greyish white layer. On glycerin agar and glycerinated potato there is the same initial delay with the subsequent formation of discrete colonies which may attain a considerable size. On glycerin broth there is often considerable difficulty in obtaining growth: a very thin, almost transparent grey pellicle may be formed, but more often the surface is covered with islands of growth.

Class 2.

The viruses in this class, 15 in number, exhibit greater variation among themselves than the preceding, very few being exactly alike. Some grow little better than those in the first class, while others approach in luxuriance those in Class 3. The following description applies to the intermediate viruses :—

Viruses.	Cultural Characters.
P. VI., VII., VIII., XIII., XIV., XX., XXX., XXXII., *XLII., XLIII., LIII., LV., LXI., LXII., LXIII.	On glycerin serum and serum alone almost equal growths are obtained, that on the former being usually rougher and whiter. On glycerin agar and glycerinated potato thin grey translucent layers with a few whiter raised colonies are formed which may subsequently attain a considerable size. The pellicle on broth is usually complete but thin and translucent.

Class 3.

In Class 3 are included the remaining 11 viruses which grow most readily and abundantly on the test media.

Viruses.	Cultural Characters.
P. IX., X., XI., XII., XV., XXIV., XXV., XXXVIII., XXXIX., LIV., LVIII.	On glycerin serum growth is much more luxuriant and is continued for a longer time than on serum alone; in appearance it is fairly thick, greyish white, rough and nodular on the surface and often slightly wrinkled. On glycerin agar the growth quickly covers the surface with a dry greyish white layer finely wrinkled and opaque in parts but often somewhat moist and greasy in appearance. Growth usually ceases in about three or four weeks, but sometimes discrete raised colonies grow up to a considerable size. Growth on potato is usually in the form of a grey or greyish white layer of only moderate thickness; occasionally individual colonies become raised and warty. On broth a complete pellicle is formed fairly readily, but it is usually translucent and never completely opaque; it is apt to become moist and sink in about three to four weeks.

Slightly Virulent Porcine Tubercle Bacilli.

Three of the porcine viruses are slightly virulent for calves and rabbits and grow much more luxuriantly than any virulent virus. Their characters are identical with those of the human tubercle bacillus. No distinction of any value can be made between them: there has been a little difficulty in obtaining a good growth on glycerin agar, but after repeated attempts in all cases a characteristically luxuriant growth has finally resulted.

Viruses.	Cultural Characters.
P. IV., XLI., XLVI.	On serum the total amount of culture is much greater than with the virulent viruses, and there is often formed a bright yellow or orange pigment. The growth on glycerin serum is invariably more abundant than on serum alone and more pigmented. On glycerin agar growth takes place from the outset, and a thick continuous creamy highly wrinkled, sometimes warty, layer is quickly formed. On potato the growth is raised, warty, nodular, or wrinkled and deeply pigmented. The pellicles produced on glycerin broth and glycerin gelatin are much thicker than those produced by the virulent viruses, and are for the most part opaque, whitish or creamy, wrinkled and sometimes warty. On medicine bottles containing about 40 cc. of broth the pellicle is often thick and felt-like and fails to cover the surface completely.

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* Mammalian element of the mixture.

GENERAL SUMMARY OF INOCULATION EXPERIMENTS ON RABBITS WITH TUBERCLE BACILLI OF PORCINE ORIGIN.

RABBITS have been systematically employed in this investigation for determining the virulence of a virus since the previous investigations of tubercle bacilli of human and bovine origin have proved that they furnish a reliable means of differentiating between tubercle bacilli of high and low bovine virulence. And furthermore, by means of this animal alone a definite decision as to the nature of a virus can be made from the consideration of the character of the lesions (with reference to their extent and distribution) produced by the various forms of inoculation. It has therefore been considered unnecessary, when a porcine culture exhibiting the cultural characters of a bovine tubercle bacillus has produced in rabbits tuberculosis identical with that set up by a tubercle bacillus of bovine origin, to test in every instance its virulence for the bovine animal.

On the other hand, when a virus has caused in rabbits tuberculosis differing in extent and distribution from that set up by the bovine tubercle bacillus it has in every case been tested as to its virulence for calves and also for other species of animals.

The results of the inoculation of rabbits have shown that the bacilli isolated from tuberculous lesions in swine can be divided into three groups, exhibiting respectively the properties of the bovine, human and avian tubercle bacilli. Of the 59 viruses investigated, 50 were virulent for rabbits, 3 were slightly virulent, and 5 gave results identical with those produced by bacilli isolated from tuberculous lesions in birds. The remaining virus was a mixture of bovine and avian tubercle bacilli.

The experiments with the first two groups only are considered here, the avian bacilli being considered together with other strains of avian bacilli isolated from birds.

Cultures of the viruses in these two groups have all been inoculated into rabbits intravenously, intraperitoneally, and subcutaneously in varying doses. The subculture inoculated has been grown on bovine serum and the age has been about 21 days; the period in which the cultures have been in cultivation since isolation has varied from 75 to 281 days.

Tables have been made out giving a summary of the general results under the heading of each form of inoculation and each particular dose.

All the rabbits inoculated with the virulent viruses with the exception of one which was killed and those which succumbed to some intercurrent disorder have died of general tuberculosis. The results have been given briefly in the tabular summaries as general tuberculosis, since the types of disease produced by the several forms of inoculation are so characteristic that a general description of the lesions will suffice for each form. The culture from the original material of Virus P. XIV. has been inoculated into several series of rabbits, the total age of the cultures varying from 290 to 690 days: the apparent diminution in virulence indicated by the longer duration of life of the animals inoculated with the older cultures (*see* Table, pages 240–241) is probably only a manifestation of the general irregular virulence of the virus.

The rabbits inoculated with cultures of the slightly virulent tubercle bacilli developed a much more chronic disease and were with some exceptions in good health when killed after about three months. A general description of the lesions produced by the slightly virulent bacilli is given under each form of inoculation, but on account of the greater variation in the extent of the disease a detailed account of the post-mortem examination of each rabbit is also given in the tabular summaries.

Rabbits have been inoculated with emulsions of the original material of many of the viruses and the results which have been summarised in the form of a table (page 196) correspond in general with those obtained by the inoculation of the cultures. They have served to give a preliminary indication of the virulence of a virus: for example a rabbit inoculated with the original material of Virus P. XLVI., which proved to be a slightly virulent virus, showed no tuberculosis. And in every case in which the inoculation of the original material has caused progressive tuberculosis in a rabbit the culture isolated has proved to be virulent.

SUMMARY OF LESIONS PRODUCED IN RABBITS BY VIRULENT CULTURES UNDER EACH FORM OF INOCULATION.

INTRAVENOUS INOCULATIONS.

After an intravenous inoculation of 1·0 mg. of culture the rabbit dies of acute tuberculosis in from 9 to 20 days: after 0·1 mg. in from 11 to 26 days.

The disease produced by this form of inoculation is very acute and certain in its effects in doses of 1·0 mg. and 0·1 mg. of culture. Large numbers of tubercle bacilli are at once distributed throughout the body and the lesions which develop are numerous and wide-spread quickly leading to the death of the animal.

On examination after death the appearances are as follows: the lungs do not collapse and are closely filled with miliary caseating tubercles which in many cases cause complete consolidation especially of the small anterior lobes. The spleen is swollen and firm in consistency and the substance is speckled with grey points most evident just beneath the capsule. The liver substance is similarly closely beset with grey foci which are usually not evenly distributed but form a kind of network most clearly visible on the surface and corresponding with the lobules of the liver. The kidneys show a variable number of quite translucent tubercles in the cortices with here and there a central focus of caseation. Caseous foci are often visible in the lymphatic glands, especially in the bronchial which are enlarged and oedematous.

There is little difference in the effects of the doses of 0·1 mg. and 1·0 mg., the lesions produced by the smaller dose being more evident from the longer duration of life.

INTRAPERITONEAL INOCULATIONS.

After an intraperitoneal inoculation of 1·0 mg. of culture the rabbit dies of acute tuberculosis in from 10 to 29 days: after 0·1 mg. in from 13 to 48 days: after 0·01 mg. in from 23 to 52 days.

In the intraperitoneal inoculation as in the intravenous numerous tubercle bacilli gain access to the blood stream and with the larger doses the type of disease is very similar with the addition of peritoneal tuberculosis. After a dose of 1·0 mg. or 0·1 mg. the omentum is thickened, retracted and composed of translucent tissue with varying amounts of caseation. The parietal and visceral peritoneum are closely covered with minute tubercles most numerous on the caecum, the mesentery and the mesocolon. The lesions in the organs resemble those resulting from an intravenous inoculation, though the lungs are seldom so severely affected. Most commonly they collapse partially and contain numerous discrete caseous tubercles.

After a dose of 0·1 mg. the animal lives longer and the omentum becomes greatly enlarged and extensively caseated: the tubercles on the peritoneum are more sparsely distributed and attain a greater size.

It occasionally happens in the use of this method of inoculation that the whole of the dose administered is not deposited in the peritoneal cavity, the inoculation being made partly into the subcutaneous tissues or muscles of the abdominal wall or into the lumen of the caecum. In the event of any of these accidents the intraperitoneal dose may be very small and the disease produced is very chronic in type resembling that following a subcutaneous inoculation. When the inoculation is partly intra-caecal a caseous nodule ulcerated internally is formed in the wall of the gut and a careful examination of this organ should always be made if the duration of life of a rabbit after inoculation exceeds the usual limit.

Subcutaneous Inoculations.

After a subcutaneous inoculation of 10·0 mg. of culture, the rabbit dies of general tuberculosis in from 28 to 101 days; after 1·0 mg., in from 29 to 165 days; after 0·1 mg., in from 53 to 146 days; and after 0·01 mg., in from 69 to 125 days.

When virulent tubercle bacilli are inoculated under the skin in doses varying from 0·01 mg. to 10·0 mg., fatal tuberculosis is almost invariably produced, but the disease runs a much more chronic course than with either the intravenous or intraperitoneal inoculations.

At the seat of inoculation a caseous tumour is formed, which usually ulcerates through the skin, and the nearest lymphatic glands enlarge and caseate. The lungs and kidneys are the organs most severely affected, and the immediate cause of death is usually from the mechanical effect of destruction of the lung tissue. In a typical case the lungs fill the pleural cavities and are represented by caseous masses with confluent margins of grey translucent tissue. In very chronic cases these caseous masses may soften in the centre, with the formation of cavities. The cortices of the kidneys are filled with caseating nodules, varying in number and size. The larger nodules project prominently above the surface and on section have a wedge shape; often they are adherent to the capsule, and may be drawn out of the substance in the process of stripping the kidney. The liver and spleen are often very slightly affected, and contain a varying number of caseous nodules up to a hemp seed in size. The lymphatic glands, apart from those adjacent to the local lesion, are never much enlarged, and contain a few discrete caseous nodules. The thyroid body has often been found to be tuberculous, containing caseous tubercles or nodules which sometimes replace almost the whole of the gland substance.

In very chronic cases the intestines occasionally show large caseous nodules projecting on the peritoneal surface and ulcerated internally. In one instance a knee joint was swollen and filled with a mucinous caseous substance.

The inoculation into the subcutaneous tissues of the back is more severe than the inoculation into the subcutaneous tissues of the abdomen, and the duration of life is considerably shortened.

With regard to the value of the subcutaneous method of inoculation, the results have clearly shown that it is the most reliable method of establishing the differences in virulence between strains of tubercle bacilli.

Comparison of Results with Tubercle Bacilli of Porcine and Bovine Origin.

A comparison of the results of the inoculation of rabbits with virulent tubercle bacilli of porcine and bovine origin, shows that fatal general tuberculosis is almost invariably produced in both cases, and the extent and distribution of the lesions are essentially the same. There is also a remarkably close correspondence in the average duration of life of rabbits inoculated by the same methods and with equivalent doses, as will be seen by reference to the table on page 171, where the results are given in parallel columns.

SUMMARY OF THE LESIONS PRODUCED IN RABBITS BY THE SLIGHTLY VIRULENT PORCINE CULTURES.

Intravenous Inoculations.

The rabbits inoculated intravenously with 0·1 mg. or 1·0 mg. were all killed after the lapse of about three months.

On post-mortem examination the lungs collapse and show mainly on the surface and in the thin margins a variable number of hard grey tubercles with caseous centres and irregular grey patches, up to several millimetres in diameter, beset with caseous foci. The bronchial glands may or may not contain caseous tubercles.

The surfaces of the kidneys are pitted and scarred and show a variable number of grey nodules with soft caseous centres many of which extend as soft caseous streaks into the medulla often to the apex of the papilla; in the pelvis of either one or the other kidney, or of both, there may be a quantity of thick caseopus. The liver and spleen have never been affected.

Soft caseous miliary tubercles, containing large numbers of tubercle bacilli, are almost invariably found in the muscles of the trunk and limbs. The rabbits inoculated with culture of Virus P. IV. were more severely affected than those inoculated with Virus P. XLI. and P. XLVI., the dorsal surfaces of the caudal lobes of the lungs being covered with large caseous patches.

Intraperitoneal Inoculations.

A rabbit inoculated with 10 mg. of Virus P. IV. died of acute tuberculosis in 18 days, the disease resembling that set up by a dose of 1·0 mg. of virulent culture; the lesions, however, were fewer, not so caseous, and contained less numerous tubercle bacilli.

Another rabbit inoculated with 0·1 mg. of Virus P. IV. died after 333 days of chronic general tuberculosis; the lungs were almost completely replaced by cystic caseous nodules and there were large fibro-caseous masses on the pleura, diaphragm, and pericardium; cultures isolated from the lung and the omentum grew as luxuriantly as the original culture.

All the other rabbits inoculated intraperitoneally were killed after periods of about three months and showed chronic general tuberculosis similar to but rather less extensive than that which follows an intravenous inoculation.

In these cases the omentum is not rolled up and contains a varying number of grey or greyish white tubercles usually gritty in the centre and often aggregated together; similar tubercles are seen on the mesentery and mesocolon clustered together in a characteristic manner in the centres of the regions bounded by the mesenteric vessels.

Subcutaneous Inoculations.

The disseminated lesions produced by this form of inoculation are fewer in number and less in extent than with either of the two preceding forms.

At the seat of inoculation a circumscribed tumour develops which may attain a considerable size and always softens; it rarely ulcerates through the skin. The nearest glands are enlarged and contain softened caseous nodules.

The lungs are normal in general appearance and show on the surface a few grey tubercles and nodules only. Other organs and glands are normal with the exception of occasional slight disease in the kidneys. This form of inoculation brings out more sharply than any other the difference in virulence for rabbits that exists between the virulent and slightly virulent strains of tubercle bacilli.

TABLES SHOWING COMPARATIVELY THE DURATION OF LIFE OF RABBITS INOCULATED WITH CULTURES OF :—

A.

VIRULENT TUBERCLE BACILLI OF PORCINE ORIGIN.

Method of Inoculation.	Dose.	Number of Rabbits.	Duration of Life in Days.	Average.
Intravenous	1·0 mg.	29	9—20	14·8
,, ...	0·1 mg.	52	11—26	18·9
Intraperitoneal	1·0 mg	38	10—29	17·9
,, ...	0·1 mg.	41	13—48	27·6
,, ...	0·01 mg.	13	23—52	34·2
Subcutaneous	10·0 mg.	18	28—101	53·7
,, ...	1·0 mg.	48	29—165	69·8
,, ...	0·1 mg.	25	53—146	87·2
,, ...	0·01 mg.	12	69—125	89·3
Subcutaneous in tissues of back	1·0 mg.	11	40—86	65·9
Subcutaneous in tissues of abdomen... ...	1·0 mg.	23	51—165	77·7

B.

VIRULENT TUBERCLE BACILLI OF BOVINE ORIGIN.

Method of Inoculation.	Dose.	Number of Rabbits.	Duration of Life in Days.	Average.
Intravenous	1·0 mg.	13	10—21	14·3
,, ...	0·1 mg.	47	11—34	20·3
Intraperitoneal	1·0 mg.	53	11—38	17·8
,, ...	0·1 mg.	33	14—40	22·9
,, ...	0·01 mg.	9	22—65	35·0
Subcutaneous	10·0 mg.	—	—	—
,, ...	1·0 mg.	52	38—126	72·8
,, ...	0·1 mg.	26	49—137	87·6
,, ...	0·01 mg.	—	—	—
Subcutaneous in tissues of back	1·0 mg.	10	—	62·9

GENERAL SUMMARY OF INOCULATION EXPERIMENTS WITH TUBERCLE BACILLI OF PORCINE ORIGIN ON CALVES, PIGS, GUINEA-PIGS, AND RATS.

CALVES.

Virulent Viruses.

Fourteen calves have been inoculated subcutaneously each with 50 milligrammes of culture derived from seven of the virulent viruses. Six of the cultures tested have proved equal in virulence to tubercle bacilli of bovine origin and have caused the death of the calves in from 19 to 48 days, setting up in every case severe general tuberculosis. Cultures derived from the original material of the remaining Virus (P. XIV.) have been inoculated into four calves and have caused only moderately severe tuberculosis. This culture is definitely less virulent than any culture from a bovine source, but after a single passage through the calf it became fully virulent. The two calves inoculated with the first passage culture died of severe general tuberculosis in 46 and 32 days respectively, while of the four calves inoculated with the culture of the original material two died in 76 and 80 days, and two were killed after 87 and 104 days with tuberculosis only of moderate severity.

A calf was inoculated intravenously with 50 milligrammes of culture of Virus P. XXIX. and died of acute tuberculosis in 16 days.

Slightly Virulent Viruses.

Ten calves have been inoculated subcutaneously with doses varying from 34 to 200 milligrammes of culture derived from the three slightly virulent viruses P. IV., P. XLI., P. XLVI. All of the animals but one showed after periods varying from 90 to 105 days only slight and non-progressive tuberculosis. The single exception was a calf, No. 312, which was inoculated with culture of Virus P. IV., and showed 90 days later tuberculous consolidation of the dorsal parts of the caudal lobes of the lungs with only slight disease elsewhere: the animal became very unwell in the fifth week after the inoculation with considerable respiratory distress and seemed likely to die: it is possible that the lung condition had been worse at that time and was in progress to recovery when the animal was killed. Calf 314 inoculated at the same time with 34 milligrammes showed after 135 days an extremely slight amount of tuberculosis.

PIGS.

None of the virulent viruses has been tested in pigs.

The three slightly virulent viruses have been tested on 11 pigs, seven inoculated subcutaneously and four by feeding.

Eight of the pigs when killed were in good condition and showed only slight non-progressive tuberculosis.

One pig, No. 166, inoculated subcutaneously with 50 milligrammes of culture of Virus P. XLI., when killed after 102 days had extensive tuberculous consolidation of the lungs without any sign of caseation: the bronchial and dorsal mediastinal glands were normal in appearance: the kidneys contained in the cortices yellowish grey nodules. Guinea-pigs inoculated with the substance of the liver, spleen, lungs and kidneys became tuberculous. The culture isolated from the lung of the pig grew like the original culture, and was inoculated into another pig and into rabbits. The second pig, No. 202, died after 64 days of a similar pneumonic condition of the lungs, and from the lung a culture was isolated possessing the characters of the original culture. This culture was inoculated subcutaneously into a third pig, No. 258, which succumbed to a tuberculous broncho-pneumonia in 103 days. The cultures recovered were unaltered in characters and remained slightly virulent for rabbits. The interest of this experiment lies in the fact that a culture resembling closely the common human tubercle bacillus, caused when inoculated subcutaneously fatal tuberculosis in three pigs in succession without showing alteration in characters or virulence for rabbits.

GUINEA-PIGS.

Guinea-pigs have been inoculated intraperitoneally and subcutaneously with all the viruses, and in every case death from general tuberculosis has resulted. The lesions produced by the slightly virulent viruses have on the whole been less acute than those set up by the virulent, but there have not been sufficient experiments with the former to enable any conclusions to be drawn from a comparison of the duration of life.

Guinea-pigs inoculated intraperitoneally with doses of 0·1 mg. of virulent porcine cultures have died of acute tuberculosis in from 10 to 27 days, the average duration of life of 48 guinea-pigs being 16·2 days. The duration of life after a similar inoculation of bovine tubercle bacilli is from 10 to 31 days; average 17·8.

Guinea-pigs inoculated subcutaneously with doses of 0·1 mg. of virulent porcine cultures have died of general tuberculosis in from 26 to 83 days, the average duration of life of 50 guinea-pigs being 44·9 days. The duration of life after a similar inoculation of bovine tubercle bacilli is from 22 to 74 days; average 44·1.

Guinea-pigs were almost invariably inoculated with emulsions of the original material. Out of the total of 49 guinea-pigs five died of acute infections, three showed no tuberculosis, and 36 developed general tuberculosis. The five remaining guinea-pigs were inoculated with the original material from which the avian cultures were isolated: four developed local tuberculosis only, and the fifth remained healthy.

RATS.

Nine rats have been inoculated, six intraperitoneally and three subcutaneously, with cultures from four of the virulent viruses; and three rats, two intraperitoneally and one subcutaneously, with culture from the slightly virulent Virus P. IV., the doses varying from 5 to 40 mg.

The general results are the same as those produced by the inoculation of bovine and human tubercle bacilli from other sources—there is a wide distribution of bacilli over the body without the formation of characteristic tuberculous lesions.

All the rats inoculated intraperitoneally died, except one which was killed accidentally, and numerous tubercle bacilli were found in smear preparations from the organs; except for some small nodules on the peritoneum in some of the cases none of the animals showed definite tuberculous lesions, the only signs of infection being enlargement of the spleen and congestion of the lungs, or, as occurred in one case, pneumonic consolidation.

One of the rats inoculated subcutaneously died in 33 days from a non-tuberculous affection of the lungs; the other three were killed in periods varying from 211 to 253 days. Nothing of a tuberculous nature were seen beyond the site of inoculation, but in all cases tubercle bacilli were found in the organs, their number, however, being much less than in animals inoculated intraperitoneally.

TABULAR SUMMARIES OF THE INOCULATION EXPERIMENTS.

TABULAR SUMMARY OF INOCULATION EXPERIMENTS ON CALVES WITH CULTURES OF VIRULENT TUBERCLE BACILLI OF PORCINE ORIGIN.

SUBCUTANEOUS INOCULATIONS.

Virus.	Strain.	Dose.	Generation and Age of Sub-culture inoculated.	Total period under Cultivation.	Number of Calf.	Weight in kilos.	Duration of Life.	Result.
P. V.	Original material.	50 mg.	7th generation, 20 days old.	134 days	336	29·48	Died, 29 days	General tuberculosis severe.
P. VI.	Original material through G.P. 1,515.	50 mg.	6th generation, 20 days old.	126 days	326	41·27	Killed when very ill, 29 days.	General tuberculosis. severe.
P. VIII.	Original material.	50 mg.	5th generation, 20 days old.	117 days	328	34·00	Died, 28 days	General tuberculosis, severe.
P. IX.	Original material.	50 mg.	7th generation, 20 days old.	125 days	334	41·72	Died, 45 days	General tuberculosis, severe.
P. XI.	Original material.	46·5 mg.	4th generation, 20 and 21 days old.	97 days	338	31·75	Died, 37 days	General tuberculosis, severe.
P. XII.	Original material through G.P. 1,636.	50 mg.	5th generation, 20 days old.	101 days	376	39·46	Killed when dying, 19 days.	General tuberculosis, severe.
		50 mg.	9th generation, 21 days old.	298 days	444	37·19	Killed when dying, 48 days.	General tuberculosis, severe.
		50 mg.	9th generation, 21 days old.	298 days	450	36·74	Died, 41 days	General tuberculosis, severe.
P. XIV.	Original material through G.P. 1,623.	50 mg.	12th generation, 21 days old.	290 days	446	36·74	Died, 80 days	Slight general tuberculosis. Death from cystitis and nephritis, caused by urinary calculi.
		50 mg.	12th generation, 21 days old.	290 days	448	31·75	Killed when moderately well, 104 days.	General progressive tuberculosis of moderate severity.
		50 mg.	21st generation, 21 days old.	581 days	532	39·90	Died, 76 days	General tuberculosis, severe in the lungs.
		50 mg.	21st generation, 21 days old.	581 days	534	54·87	Killed when well, 87 days.	General progressive tuberculosis of moderate severity.
	Calf 448 (Lung).	50 mg.	8th generation, 21 days old.	187 days	536	58·50	Died, 46 days	General tuberculosis, severe.
		50 mg.	8th generation, 21 days old.	187 days	538	43·99	Died, 32 days	General tuberculosis, severe.

INTRAVENOUS INOCULATION.

P. XXIX.	Original material.	50 mg.	12th generation, 24 days old.	383 days	454	131·98	Died, 16 days.	General tuberculosis.

TABULAR SUMMARY OF INOCULATION EXPERIMENTS ON CALVES WITH CULTURES OF SLIGHTLY VIRULENT TUBERCLE BACILLI OF PORCINE ORIGIN.

SUBCUTANEOUS.

Virus.	Strain.	Dose.	Generation and age of subculture inoculated.	Total period under Cultivation.	No. of Calf.	Weight in kilos.	Duration of Life.	Result.
P. IV.	Original material.	50 mg.	11th generation. 21 days old	183 days	350	33·10	Killed when well. 90 days.	Small fibro-caseous local tumour. The left prescapular gland showed more than a third of the cortex caseo-calcareous. The thoracic glands contained few minute foci. One tubercle was seen in a coeliac gland, and one in the lung.
,,	,,	50 mg.	7th generation. 20 days old.	120 days	312	36·74	Killed when in fair health. 90 days.	Fibro-caseous local tumour. Prescapular gland largely composed of caseated tissue. In the lung were moderately numerous transparent tubercles irregularly distributed, and portions of the caudal lobes were consolidated. The suprarenals contained fairly numerous small tubercles. Several lymph glands contained one or more small foci.
,,	,,	34 mg.	,, ,,	,,	314	33·55	Killed. 135 days	Thin-walled cyst containing caseo-pus at seat of inoculation. Prescapular gland largely caseo-calcareous. The mesenteric glands contained minute calcareous tubercles; a single tubercle was seen in a thoracic gland.
,,	Calf 312 (Lung).	50 mg.	1th generation. 20 days old.	258 days	356	56·69	Killed when well. 105 days.	Fibroid local tumour, containing thick pus in a central cavity. Small caseous and calcareous tubercles in the left prescapular gland. No tuberculosis elsewhere.
,,	,,	50 mg.	,, ,,	,,	358	63·50	Killed when well. 93 days.	Thin-walled cyst at seat of inoculation containing caseo-pus and watery fluid. In the left prescapular gland was a caseo-calcareous mass. One or two minute tubercles were seen in a mediastinal and a portal gland, and in lung (?).
,,	Calf 358 (Prescap. gland).	200 mg.	5th generation. 21 days old.	86 days	426	29·02	Died. 29 days Death due to diarrhœa.	Caseo-necrotic tumour. The adjacent glands were firm, and infiltrated with a yellow caseous network. Moderate numbers of minute grey tubercles were seen in the lungs; there were numerous similar tubercles in the liver.
P. XLI.	Original material.	50 mg.	8th generation. 21 days old.	175 days	478	73·48	Killed when well. 99 days.	Fibrous-walled cyst containing caseo-purulent substance at seat of inoculation; caseo-calcareous nodules in prescapular gland. There was a tuberculous nodule adjacent to the gland. No tuberculosis elsewhere.
,,	,,	100 mg.	,, ,,	,,	480	68·90	Killed when well. 98 days.	Fibrous-walled cyst at seat of inoculation containing turbid fluid and caseous masses. In the left prescapular gland were two caseo-calcareous nodules. The left prepectoral gland showed caseo-calcareous streaks in a translucent network. A few scattered grey tubercles were seen in the liver.
P. XLVI.	Original material.	50 mg.	7th generation. 21 days old.	136 days	484	48·50	Killed when well. 102 days.	Fibrous-walled cyst at seat of inoculation containing caseo-pus. In the left prescapular gland was a single soft caseous nodule. The liver showed some irregular grey foci.
,,	,,	75 mg.	,, ,,	,,	486	51·70	Killed when well. 105 days.	Fibrous-walled cyst at seat of inoculation containing turbid fluid and caseous flakes. The left prescapular and prepectoral glands each contained a single caseous nodule. Two bronchial glands contained minute foci.

TABULAR SUMMARY OF INOCULATION AND FEEDING EXPERIMENTS ON PIGS WITH CULTURES OF SLIGHTLY VIRULENT TUBERCLE BACILLI OF PORCINE ORIGIN.

Virus.	Strain.	Dose.	Generation and Age of Subculture Inoculated.	Total period under Cultivation.	No. of Pig.	Weight in Kilos.	Method of Inoculation.	Duration of Life.	Result.
P. IV.	Original material.	1·0 mg.	11th generation, 21 days old.	183 days	124	10·0	Fed	Killed, 118 days	A submaxillary gland on each side contained a moderate number of caseous gritty nodules. One mesenteric gland showed two caseous gritty tubercles. Two caseo-calcareous tubercles in the lungs. One portal and one bronchial gland contained two pinhead sized tubercles. No tuberculosis elsewhere.
,,	,,	1·0 mg.	,, ,,	,,	126	8·5	Subcut.	Killed, 114 days	Caseous gritty encapsuled nodule the size of a broad bean at the seat of inoculation. Inguinal glands moderately caseated. A few yellowish tubercles in two portal glands. Discrete caseous gritty submiliary tubercles in the lungs. A few caseo-calcareous tubercles in the mesenteric glands.
,,	Calf 312 (Lung).	1·0 mg.	4th generation, 20 days old.	126 days	132	26·0	Subcut.	Killed, 122 days	Fibro-caseous gritty local tumour. Caseous gritty nodules in the inguinal glands. Three small tubercles in the liver. Caseo-calcareous tubercles in the portal glands. In the lungs there were ten glassy tubercles. Ventral mediastinal gland caseated. A few foci in coeliac and bronchial glands.
,,	,,	1·0 mg.	,, ,,	,,	134	20·25	Fed	Killed, 128 days	Caseous gritty nodules in the submaxillary glands. A single grey tubercle in the lung. Other organs and glands normal.
P. XLI.	Original material.	50·0 mg.	10th generation, 21 days old.	245 days	166	—	Subcut.	Killed, 102 days	At the seat of inoculation there were two small ulcers and a few miliary caseo-calcareous tubercles in the subcutaneous tissue. Caseation of inguinal and ventral mediastinal glands. Extensive tuberculous consolidation of the lungs. Grey fibroid tubercles on pleura and diaphragm. Caseous miliary tubercle in spleen. Moderately numerous yellowish grey nodules in the kidneys. One tubercle in a suprarenal body.
,,	,,	50·0 mg.	,, ,,	,,	172	—	Fed	Killed, 98 days	A submaxillary gland on each side contained caseous slightly gritty nodules. The mesenteric glands showed caseous nodules up to a pea in size. In the liver there was one caseous tubercle. A few tubercles were seen in the portal glands. There were scattered glassy tubercles in the lungs.
,,	Pig 166 (Lung).	50·0 mg.	7th generation, 20 days old.	484 days	202	29·0	Subcut.	Died, 64 days	Cyst filled with caseo-pus at the seat of inoculation. Right inguinal and sternal glands caseous and softened. Lungs extensively consolidated (T.B.). Caseous tubercles in the bronchial and mediastinal glands. A few pale areas in the kidneys. No tuberculosis elsewhere.
,,	Emulsion of Lung of Pig 202.	9·0 cc.	—	—	228	19·95	Subcut.	Killed, 166 days	Cyst filled with soft caseous gritty substance at the seat of inoculation. Caseous nodules in the inguinal glands. In the lungs there were a few translucent foci. No tuberculosis elsewhere.
,,	Pig 202 (Lung).	50.0 mg.	7th generation, 16 days old.	110 days	258	18·14	Subcut.	Died, 103 days	Caseo-purulent cyst at the seat of inoculation. Left inguinal and sternal glands enlarged, caseous, and softened. Severe tuberculous consolidation of the lungs. Bronchial glands firm (T.B. numerous). Opaque patches in various lymphatic glands. No disease elsewhere.

P. XLVI.	Original material.	50·0 mg.	9th generation, 21 days old.	206 days	164	—	Subcut.	Killed, 97 days	Caseo-purulent cyst in the subcutaneous tissue and discrete caseo-calcareous tubercles at the seat of inoculation. Left inguinal and ventral, mediastinal glands partly caseated. A very few translucent and opaque foci in the lungs.
”	”	50·0 mg.	” ”	”	168	—	Fed	Killed, 60 days	Submaxillary glands beset with discrete fibro-caseous tubercles. All the mesenteric glands contained caseo-calcareous tubercles up to a hemp seed in size. Caseous foci in the colic glands. In the lungs there were six translucent tubercles.

INTRAVENOUS INOCULATIONS OF RABBITS WITH CULTURES OF VIRULENT TUBERCLE BACILLI OF PORCINE ORIGIN.

DOSE IN EACH CASE : 1·0 milligramme.

Virus.	Source of Culture.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Number of Rabbit.	Weight in Grammes.		Date of Inoculation.	Duration of Life.	Result.
					Initial.	Final.			
P. XIV.	Original material	21 days old, 23rd generation	672 days	1407	1,250	920	July 16th, 1907	Died 21 days	General tuberculosis
P. XXII.	Original material	21 days old, 4th generation	77 days	607	1,480	900	Dec. 14th, 1905	Died 14 days	General tuberculosis.
P. XXX.	Original material	19 days old, 6th generation	132 days	851	1 470	1,070	May 1st, 1906	Died 15 days	General tuberculosis.
P XXXI.	Original material	20 days old, 6th generation	140 days	861	1,750	1,220	May 9th, 1906	Died 12 days	General tuberculosis.
P XXXII	Original material	21 days old. 7th generation	143 days	850	1,500	1,050	July 5th, 1906	Died 12 days	General tuberculosis.
P. XXXIII.	Original material	22 days old, 7th generation	140 days	972	1,520	1,160	July 5th, 1906	Died 11 days	General tuberculosis.
P. XXXIV.	Original material	22 days old. 7th generation	140 days	978	1,930	1,300	July 6th, 1906	Died 18 days	General tuberculosis.
P. XXXVI	Original material	21 days old, 10th generation	245 days	1093	3,560	2,450	Nov. 23rd, 1906	Died 18 days	General tuberculosis.
P. XXXVII.	Original material	21 days old, 10th generation	245 days	1099	3,400	2,220	Nov. 23rd, 1906	Died 19 days	General tuberculosis.
P. XXXVIII.	Original material	21 days old, 8th generation	193 days	1105	3,900	2,660	Nov. 24th, 1906	Died 15 days	General tuberculosis.
P. XXXIX.	Original material	14 days old. 10th generation	281 days	1252	1,920	1,550	Feb. 20th, 1907	Died 13 days	General tuberculosis.
P. XL.	Original material	21 days old, 8th generation	196 days	1120	2,300	1,820	Nov. 27th, 1906	Died 17 days	General tuberculosis.
P. XLII.	Original material	21 days old, 8th generation	177 days	1072	1,100	940	Nov. 17th. 1906	Died 13 days	General tuberculosis.

INTRAVENOUS INOCULATIONS OF RABBITS WITH CULTURES OF VIRULENT TUBERCLE BACILLI OF PORCINE ORIGIN—*continued.*

DOSE IN EACH CASE: 1·0 milligramme—*continued.*

Virus.	Source of Culture.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Number of Rabbit.	Weight in Grammes.		Date of Inoculation.	Duration of Life.	Result.
					Initial.	Final.			
P. XLIII.	Original material	21 days old, 6th generation	169 days	**1129**	3,100	2,070	Nov. 28th, 1906	Died 16 days	General tuberculosis.
P. XLVII.	Original material	21 days old, 8th generation	183 days	**1144**	1,920	1,600	Dec. 4th, 1906	Died 16 days	General tuberculosis.
P. XLIX.	Original material	21 days old, 6th generation	157 days	**1203**	2,000	1,450	Jan. 19th, 1907	Died 14 days	General tuberculosis.
P. L.	Original material	25 days old, 7th generation	141 days	**1174**	1,170	1,000	Jan. 3rd, 1907	Died 12 days	General tuberculosis.
P. LI.	Original material	16 days old, 5th generation	95 days	**1190**	2,300	1,650	Jan. 18th, 1907	Died 11 days	General tuberculosis.
P. LII.	Original material	20 days old, 5th generation	95 days	**1197**	1,550	1,220	Jan. 18th, 1907	Died 9 days	Early general tuberculosis.
P. LIII.	Original material	21 days old, 8th generation	185 days	**1397**	1,800	1,330	July 15th, 1907	Died 14 days	General tuberculosis.
P. LIV.	Original material	21 days old, 7th generation	185 days	**1399**	1,720	1,150	July 15th, 1907	Died 19 days	General tuberculosis.
P. LV.	Original material	22 days old, 7th generation	186 days	**1403**	2,150	1,320	July 16th, 1907	Died 16 days	General tuberculosis.
P. LVI.	Original material	21 days old, 5th generation	143 days	**1440**	1,600	1,140	Sept. 9, 1907	Died 15 days	General tuberculosis.
P. LVII.	Original material	21 days old, 5th generation	117 days	**1448**	1,850	1,430	Sept. 10, 1907	Died 13 days	General tuberculosis.
P. LVIII.	Original material	21 days old, 6th generation	129 days	**1500**	3,530	2,650	Oct. 3, 1907	Died 15 days	General tuberculosis.
P. LIX.	Original material	21 days old, 6th generation	119 days	**1496**	2,370	1,610	Oct. 2, 1907	Died 20 days	General tuberculosis.
P. LX.	Original material	14 days old, 6th generation	118 days	**1491**	2,250	1,750	Oct. 1, 1907	Died 14 days	General tuberculosis.
P. LXI.	Original material	21 days old, 5th generation	101 days	**1510**	1,820	1,390	Oct. 8, 1907	Died 14 days	General tuberculosis.
P. LXII.	Original material	21 days old, 5th generation	107 days	**1513**	2,150	1,220	Oct. 14, 1907	Died 17 days	General tuberculosis.
P. LXIII.	Original material	24 days old, 4th generation	94 days	**1522**	2,050	1,500	Oct. 22, 1907	Died 17 days	General tuberculosis.
DOSE IN EACH CASE: 0·1 milligramme.									
P. I.	Original material	21 days old, 8th generation	138 days	**370**	770	700	July 19th, 1905	Died 19 days	General tuberculosis.
P. V.	Original material	20 days old, 7th generation	134 days	**397**	1,200	920	Aug. 30th, 1905	Died 21 days	General tuberculosis.

P. VI.	Guinea-pig 1515	20 days old, 6th generation	126 days	403	1.870	1,370	Sept. 1st, 1905	Died 20 days	General tuberculosis.
P. VII.	Original material	20 days old, 8th generation	144 days	457	1,470	1,250	Sept. 18th, 1905	Died 22 days	General tuberculosis.
P. VIII.	Original material	20 days old, 5th generation	117 days	427	1.220	1.080	Sept. 5th, 1905	Died 18 days	General tuberculosis.
P. IX.	Original material	20 days old, 7th generation	125 days	469	1.350	1.040	Sept. 20th, 1905	Died 16 days	General tuberculosis.
P. X.	Original material	21 days old, 5th generation	116 days	448	1.250	970	Sept. 11th, 1905	Died 19 days	General tuberculosis.
P. XI.	Original material	20·5 days old, 4th generation	97 days	438	2.170	1,650	Sept. 6th, 1905	Died 19 days	General tuberculosis.
P. XII.	Guinea-pig 1636	20 days old, 5th generation	101 days	597	1,980	1,320	Dec. 14th, 1905	Died 19 days	General tuberculosis.
P. XIII.	Original material	21 days old, 6th generation	116 days	509	2,750	2,010	Oct 31st, 1905	Died 21 days	General tuberculosis.
P. XIV.	Guinea-pig 1623	21 days old, 6th generation	139 days	694	1.210	900	Jan. 29th, 1906	Died 19 days	General tuberculosis.
P. XIV.	Original material.	21 days old, 21st generation	581 days	1307	1,900	1.100	April 16, 1907	Died 67 days	General tuberculosis.
P. XIV.	Original material.	21 days old, 23rd generation	672 days	1406	1,510	890	July 16, 1907	Died 45 days	General tuberculosis.
P. XV.	Original material	20 days old, 8th generation	114 days	533	1.380	1.250	Nov. 23rd, 1905	Died 13 days	Early general tuberculosis.
P. XVI.	Original material	20 days old, 5th generation	100 days	527	1.450	1.250	Nov. 22nd, 1905	Died 17 days	General tuberculosis.
P. XVII.	Original material	20 days old, 6th generation	123 days	610	1.360	1.060	Dec. 15th, 1905	Died 20 days	General tuberculosis.
P. XVIII.	Original material	20 days old, 6th generation	119 days	584	1,690	1,370	Dec. 11th, 1905	Died 20 days	General tuberculosis.
P. XIX.	Original material	20 days old, 6th generation	128 days	622	1.520	1.250	Dec. 20th, 1905	Died 21 days	General tuberculosis.
P. XX.	Original material	21 days old, 5th generation	85 days	779	1.190	900	Feb. 23rd, 1906	Died 15 days	General tuberculosis.
P. XXII.	Original material	21 days old, 4th generation	77 days	608	1,160	920	Dec. 14th, 1905	Died 7 days	No tuberculosis.
	Rabbit 483	20 days old, 5th generation	77 days	703	1.750	1,410	Feb. 2nd, 1906	Died 15 days	General tuberculosis.
P. XXIII.	Original material	21 days old, 6th generation	116 days	670	1.700	1.610	Jan. 22nd, 1906	Died 16 days	General tuberculosis.
P. XXIV.	Guinea-pig 1790	20 days old, 3rd generation	102 days	803	1.350	1.180	March 20th, 1906	Died 19 days	General tuberculosis.
P. XXV.	Original material	6 days old, 6th generation	76 days	780	1.050	740	Feb. 22nd, 1906	Died 15 days	General tuberculosis.
P. XXVI.	Original material	22 days old, 6th generation	126 days	826	1 140	900	April 13th, 1906	Died 13 days	General tuberculosis.
P. XXIX.	Original material	21 days old, 5th generation	114 days	820	1.710	1,250	April 13th, 1906	Died 17 days	General tuberculosis.
P. XXX.	Original material	19 days old, 6th generation	132 days	852	1.200	930	May 1st, 1906	Died 22 days	General tuberculosis.
P. XXXI.	Original material	20 days old, 6th generation	140 days	628	1,100	—	May 9th, 1906	Died 1 day	Death due to psorospermosis of liver.
P. XXXII.	Original material	21 days old, 7th generation	143 days	966	1.760	1,080	July 5th, 1906	Died 18 days	General tuberculosis.

INTRAVENOUS INOCULATIONS OF RABBITS WITH CULTURES OF VIRULENT TUBERCLE BACILLI OF PORCINE ORIGIN—*continued.*

DOSE IN EACH CASE: 0·1 milligramme—*continued.*

Virus.	Source of Culture.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Number of Rabbit.	Weight in Grammes.		Date of Inoculation.	Duration of Life.	Result.
					Initial.	Final.			
P. XXXIII.	Original material	22 days old, 7th generation	140 days	**976**	1,370	950	July 5th, 1906	Died 20 days	General tuberculosis.
P. XXXIV.	Original material	22 days old, 7th generation	140 days	**983**	880	700	July 6th, 1906	Died 12 days	Early general tuberculosis.
P. XXXVI.	Original material	21 days old, 10th generation	245 days	**1094**	3,260	2,200	Nov. 23rd, 1906	Died 26 days	General tuberculosis.
P. XXXVII.	Original material	21 days old, 10th generation	245 days	**1100**	2,900	2,150	Nov. 23rd, 1906	Died 21 days	General tuberculosis.
P. XXXVIII.	Original material	21 days old, 8th generation	193 days	**1106**	2,400	1,720	Nov. 24th, 1906	Died 11 days	Early general tuberculosis.
P. XXXIX.	Original material	14 days old, 10th generation	281 days	**1251**	1,900	1,430	Feb. 20th, 1907	Died 16 days	General tuberculosis.
P. XL.	Original material	21 days old, 8th generation	196 days	**1117**	2,200	1,450	Nov. 27th, 1906	Died 25 days	General tuberculosis.
P. XLII.	Original material	21 days old, 8th generation	177 days	**1071**	1,200	1,000	Nov. 17th, 1906	Died 19 days	General tuberculosis.
P. XLIII.	Original material	21 days old, 6th generation	169 days	**1127**	2,320	1,960	Nov. 28th, 1906	Died 18 days	General tuberculosis.
P. XLVII.	Original material	21 days old, 8th generation	183 days	**1143**	1,600	—	Jan. 19th, 1907	Died 20 days	General tuberculosis.
P. XLIX.	Original material	21 days old, 6th generation	157 days	**1202**	1,600	1,120	Jan. 19th, 1907	Died 13 days	General tuberculosis.
P. L.	Original material	25 days old, 7th generation	141 days	**1173**	1,870	1,150	Jan. 3rd, 1907	Died 24 days	General tuberculosis.
P. XLI.	Original material	16 days old, 5th generation	95 days	**1191**	1,950	1,370	Jan. 18th, 1907	Died 16 days	General tuberculosis.
P. LII.	Original material	20 days old, 5th generation	95 days	**1196**	1,700	1,400	Jan. 18th, 1907	Died 18 days	General tuberculosis.
P. LIII.	Original material	21 days old, 8th generation	185 days	**1396**	2,170	1,150	July 15th, 1907	Died 23 days	General tuberculosis.
P. LIV.	Original material	21 days old, 7th generation	185 days	**1398**	1,520	1,100	July 15th, 1907	Died 19 days	General tuberculosis.
P. LV.	Original material	22 days old, 7th generation	186 days	**1402**	2,180	1,500	July 16th, 1907	Died 20 days	General tuberculosis.
P. LVI.	Original material	21 days old, 5th generation	143 days	**1437**	1,400	1,010	Sept. 9, 1907	Died 26 days	General tuberculosis.
P. LVI.	Original material	21 days old, 5th generation	143 days	**1441**	1,460	1,320	Sept. 9, 1907	Died 17 days	General tuberculosis.
P. LVII.	Original material	21 days old, 5th generation	117 days	**1447**	1,240	950	Sept. 10, 1907	Died 19 days	General tuberculosis.
	Original material			**1449**	1,310	980		Died 21 days	General tuberculosis.

P. LVIII.	Original material	21 days old, 6th generation	129 days	1498	2,050	1,400	Oct. 3, 1907	Died 22 days	General tuberculosis.
P. LIX.	Original material	21 days old, 6th generation	119 days	1494	1,240	890	Oct. 2, 1907	Died 21 days	General tuberculosis.
P. LX.	Original material	14 days old, 6th generation	118 days	1489	1,670	1,150	Oct. 1, 1907	Died 22 days	General tuberculosis.
P. LXI.	Original material	14 days old, 8th generation	121 days	1530	1,230	930	Oct. 28, 1907	Died 19 days	General tuberculosis.
P. LXII.	Original material	21 days old, 5th generation	107 days	1514	1,540	1,100	Oct. 14, 1907	Died 23 days	General tuberculosis.
P. LXIII.	Original material	24 days old, 4th generation	94 days	1520	1,470	1,170	Oct. 22, 1907	Died 18 days	General tuberculosis.

INTRAPERITONEAL INOCULATIONS OF RABBITS WITH CULTURES OF VIRULENT TUBERCLE BACILLI OF PORCINE ORIGIN.

DOSE IN EACH CASE: 1·0 milligramme

P. I.	Original material	21 days old, 8th generation	138 days	366	940	750	July 19th, 1905	Died 17 days	General tuberculosis.
	Original material			367	810	660		Died 29 days	General tuberculosis.
P. V.	Original material	20 days old, 7th generation	134 days	394	2,730	1,470	Aug. 30th, 1905	Died 21 days	General tuberculosis.
	Original material			399	1,000	800		Died 13 days	General tuberculosis.
P. VI.	Guinea-pig 1515	20 days old, 6th generation	126 days	401	3,745	2,590	Sept. 1st, 1905	Died 15 days	General tuberculosis.
	Guinea-pig 1515			404	1,550	1,200		Died 20 days	General tuberculosis.
P. VII.	Original material	20 days old, 8th generation	144 days	453	2,020	1,500	Sept. 18th, 1905	Died 57 days	General tuberculosis. Inoculation partly intra-caecal.
	Original material			456	1,590	1,400		Died 16 days	General tuberculosis.
P. VIII.	Original material	20 days old, 5th generation	117 days	424	1,850	1,370	Sept. 5th, 1905	Died 18 days	General tuberculosis.
P. IX.	Original material	20 days old, 7th generation	125 days	466	1,520	1,250	Sept. 20th, 1905	Died 20 days	General tuberculosis.
P. X.	Original material	21 days old, 5th generation	116 days	445	1,450	1,120	Sept. 11th, 1905	Died 20 days	General tuberculosis.
	Original material			446	1,170	820		Died 18 days	General tuberculosis.
P. XI.	Original material	20·5 days old, 4th generation	97 days	436	2,070	1,720	Sept. 6th, 1905	Died 17 days	General tuberculosis.
P. XII.	Guinea-pig 1636	20 days old, 5th generation	101 days	598	1,670	1,250	Dec. 14th, 1905	Died 16 days	General tuberculosis.
P. XIII.	Original material	21 days old, 6th generation	116 days	507	2,850	2,250	Oct. 30th, 1905	Died 20 days	General tuberculosis.
P. XIV.	Guinea-pig 1623	21 days old, 6th generation	139 days	695	1,280	—	Jan. 29th, 1906	Died 10 days	Early general tuberculosis.

INTRAPERITONEAL INOCULATIONS OF RABBITS WITH CULTURES OF VIRULENT TUBERCLE BACILLI OF PORCINE ORIGIN—*continued.*

DOSE IN EACH CASE: 1·0 milligramme—*continued.*

Virus.	Source of Culture.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Number of Rabbit.	Weight in Grammes.		Date of Inoculation.	Duration of Life.	Result.
					Initial.	Final.			
P. XV.	Original material	20 days old, 8th generation	114 days	**531**	1,560	1,120	Nov. 23rd, 1905	Died 13 days	Early general tuberculosis.
P. XVI.	Original material	20 days old, 5th generation	100 days	**525**	1,330	1,060	Nov. 22nd, 1905	Died 14 days	Early general tuberculosis.
P. XVII.	Original material	20 days old, 6th generation	123 days	**613**	1,250	1,000	Dec. 15th, 1905	Died 18 days	General tuberculosis.
P. XVIII.	Original material	20 days old, 6th generation	119 days	**585**	1,520	1,130	Dec. 11th, 1905	Died 37 days	General tuberculosis. Inoculation partly intra-caecal.
P. XIX.	Original material	20 days old, 6th generation	128 days	**619**	1,920	1,310	Dec. 20th, 1905	Died 22 days	General tuberculosis.
P. XX.	Original material	21 days old, 5th generation	85 days	**789**	1,420	900	Feb. 23rd, 1906	Died 19 days	General tuberculosis.
P. XXII.	Original material	21 days old, 4th generation	77 days	**609**	1,170	1,640	Dec. 14th, 1905	Died 38 days	General tuberculosis. Inoculation partly subcutaneous.
	Rabbit 483	20 days old, 5th generation	77 days	**707**	1,980	1,370	Feb. 2nd, 1906	Died 15 days	General tuberculosis.
P. XXIII.	Original material	21 days old, 6th generation	116 days	**668**	2,000	1,570	Jan. 22nd, 1906	Died 21 days	General tuberculosis.
P. XXIV.	Guinea-pig 1790	20 days old, 3rd generation	102 days	**807**	1,550	1,130	March 20th, 1906	Died 18 days	General tuberculosis.
P. XXV.	Original material	6 days old, 6th generation	75 days	**781**	1,420	870	Feb. 22nd, 1906	Died 17 days	General tuberculosis.
P. XXVI.	Original material	22 days old, 6th generation	126 days	**829**	1,740	1,120	April 13th, 1906	Died 20 days	General tuberculosis.
P. XXIX.	Original material	21 days old, 5th generation	114 days	**824**	1,600	1,070	April 13th, 1906	Died 18 days	General tuberculosis.
P. XXX.	Original material	19 days old, 6th generation	132 days	**853**	1,780	1,300	May 1st, 1906	Died 24 days	General tuberculosis.
P. XXXI.	Original material	20 days old, 6th generation	140 days	**863**	1,900	1,170	May 9th, 1906	Died 17 days	General tuberculosis.
P. XXXII.	Original material	21 days old, 7th generation	143 days	**969**	1,540	—	July 5th, 1906	Died 8 days	Early generalized tuberculosis.
P. XXXIII.	Original material	22 days old, 7th generation	140 days	**974**	1,000	800	July 5th, 1906	Died 11 days	Early general tuberculosis.
P. XXXIV.	Original meterial	22 days old, 7th generation	140 days	**979**	1,510	1,050	July 6th, 1906	Died 15 days	General tuberculosis.
P. XXXVI.	Original material	21 days old, 10th generation	245 days	**1096**	950	700	Nov. 23rd, 1906	Died 19 days	General tuberculosis.
P. XXXVII.	Original material	22 days old, 10th generation	245 days	**1101**	2,200	1,800	Nov. 23rd, 1906	Died 10 days	Peritoneal tuberculosis. Death from cellulitis of the back.

P. XXXVIII.	Original material	21 days old. 8th generation	193 days	1107	2.600	1,900	Nov. 24th, 1906	Died 21 days	General tuberculosis.
P. XXXIX.	Original material	21 days old. 6th generation	196 days	1111	1.750	1 350	Nov. 27th. 1906	Died 41 days	General tuberculosis. Inoculation partly intra-caecal.
P. XXXIX.	Original material	14 days old. 10th generation	281 days	1253	1.450	1,070	Feb. 20th. 1907	Died 20 days	General tuberculosis.
P. XL.	Original material	21 days old. 8th generation	196 days	1122	2.200	1.750	Nov. 27th. 1906	Died 19 days	General tuberculosis.
P. XLII.	Original material	21 days old, 8th generation	177 days	1074	1,250	1,080	Nov. 17th, 1906	Died 18 days	General tuberculosis.
P. XLIII.	Original material	21 days old. 6th generation	169 days	1128	2,150	1.750	Nov. 28th. 1906	Died 8 days	Early general tuberculosis.
P. XLVII.	Original material	21 days old, 8th generation	183 days	1140	1.550	1.360	Dec. 4th. 1906	Died 20 days	General tuberculosis.
P. XLIX.	Original material	21 days old. 6th generation	157 days	1205	1,600	—	Jan. 19th, 1907	Died 56 days	General tuberculosis. Inoculation partly intra-caecal.
P. L.	Original material	25 days old. 7th generation	141 days	1176	1.700	1,400	Jan. 3rd. 1907	Died 16 days	General tuberculosis.
P. LI.	Original material	16 days old. 5th generation	95 days	1192	2,070	1,520	Jan. 18th, 1907	Died 16 days	General tuberculosis.
P. LII.	Original material	20 days old. 5th generation	95 days	1199	2,070	1,670	Jan. 18th, 1907	Died 9 days	Early general tuberculosis.

DOSE IN EACH CASE: 0·1 milligramme.

P. I.	Original material	21 days old. 8th generation	138 days	369	810	620	July 19th, 1905	Died 29 days	General tuberculosis.
P. V.	Original material	20 days old. 7th generation	134 days	398	1,020	700	Aug. 30th. 1905	Died 29 days	General tuberculosis.
P. VI.	Guinea-pig 1 515	20 days old. 6th generation	126 days	405	1,320	1,070	Sept. 1st. 1905	Died 33 days	General tuberculosis.
P. VII.	Original material	20 days old. 8th generation	144 days	455	1,690	1.300	Sept. 18th, 1905	Died 26 days	General tuberculosis.
	Original material			460	820	700		Died 19 days	General tuberculosis.
P. VIII.	Original material	20 days old. 5th generation	117 days	426	1,420	1,500	Sept. 5th. 1905	Died 27 days	General tuberculosis.
P. IX.	Original material	20 days old, 7th generation	125 days	468	1.400	1,200	Sept. 20th. 1905	Died 30 days	General tuberculosis.
P. X.	Original material	21 days old, 5th generation	116 days	449	1.330	970	Sept. 11th, 1905	Died 25 days	General tuberculosis.
P. XI.	Original material	20·5 days old, 4th generation	97 days	439	1,350	1,020	Sept. 6th. 1905	Died 23 days	General tuberculosis.
	Original material			440	1.600	1,620		Died 27 days	General tuberculosis.
P. XII.	Guinea-pig 1,636	20 days old. 5th generation	101 days	600	1,440	1.250	Dec. 14th, 1905	Died 18 days	General tuberculosis.
P. XIII.	Original material	21 days old, 6th generation	116 days	505	2,300	1.650	Oct. 30th. 1905	Died 29 days	General tuberculosis.

Intraperitoneal Inoculations of Rabbits with Cultures of Virulent Tubercle Bacilli of Porcine Origin—*continued.*

Dose in each case: 0·1 milligramme—*continued.*

Virus.	Source of Culture.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Number of Rabbit.	Weight in Grammes.		Date of Inoculation.	Duration of Life.	Result.
					Initial.	Final.			
P. XIV.	Guinea-pig 1,623	21 days old, 6th generation	139 days	699	1,810	1,290	Jan. 29th, 1906	Died 19 days	General tuberculosis.
P. XV.	Original material	20 days old, 8th generation	114 days	529	1,550	1,070	Nov. 23rd, 1905	Died 20 days	General tuberculosis.
P. XVI.	Original material	20 days old, 5th generation	100 days	523	1,530	920	Nov. 22nd, 1905	Died 21 days	General tuberculosis.
P. XVII.	Original material	20 days old, 6th generation	123 days	615	1,170	970	Dec. 15th, 1905	Died 19 days	General tuberculosis.
P. XVIII.	Original material	20 days old, 6th generation	119 days	582	1,360	1,360	Dec. 11th, 1905	Died 13 days	Early general tuberculosis.
P. XIX.	Original material	20 days old, 6th generation	128 days	623	1,400	1,180	Dec. 20th, 1905	Died 19 days	General tuberculosis.
P. XX.	Original material	21 days old, 5th generation	85 days	786	1,050	710	Feb. 23rd, 1906	Died 20 days	General tuberculosis.
P. XXII.	Original material	21 days old, 4th generation	77 days	606	1,010	850	Dec. 14th, 1905	Died 6 days	No visible tuberculosis.
	Rabbit 483	20 days old, 5th generation	77 days	706	1,760	1,500	Feb. 2nd, 1906	Died 24 days	General tuberculosis.
P. XXIII.	Original material	21 days old, 6th generation	116 days	671	1,560	1,280	Jan. 23rd, 1906	Died 29 days	General tuberculosis.
P. XXIV.	Guinea-pig 1790	20 days old, 3rd generation	102 days	804	1,100	780	March 20th, 1906	Died 30 days	General tuberculosis.
P. XXVI.	Original material	22 days old, 6th generation	126 days	830	1,400	920	April 13th, 1906	Died 22 days	General tuberculosis.
P. XXIX.	Original material	21 days old, 5th generation	114 days	825	1,400	850	April 13th, 1906	Died 29 days	General tuberculosis.
P. XXX.	Original material	19 days old, 6th generation	132 days	854	1,220	1,090	May 1st, 1906	Died 17 days	General tuberculosis.
P. XXXI.	Original material	20 days old, 6th generation	140 days	864	1,600	980	May 9th, 1906	Died 28 days	General tuberculosis.
P. XXXII.	Original material	21 days old, 7th generation	143 days	967	1,800	1,210	July 5th, 1906	Died 27 days	General tuberculosis.
P. XXXIII.	Original material	22 days old, 7th generation	140 days	977	1,440	920	July 5th, 1906	Died 27 days	General tuberculosis.
P. XXXIV.	Original material	22 days old, 7th generation	140 days	930	1,100	770	July 6th, 1906	Died 23 days	General tuberculosis.
P. XXXVI.	Original material	21 days old, 10th generation	245 days	1095	920	800	Nov. 23rd, 1906	Died 35 days	General tuberculosis.
P. XXXVII.	Original material	21 days old, 10th generation	245 days	1102	880	800	Nov. 23rd, 1906	Died 48 days	General tuberculosis.
P. XXXVIII.	Original material	21 days old, 8th generation	193 days	1108	2,470	1,450	Nov. 24th, 1906	Died 23 days	General tuberculosis.

P. XXXIX.	Original material	21 days old, 6th generation	196 days	1113	1,700	1,300	Nov. 27th, 1906	Died 30 days	General tuberculosis.
P. XL.	Original material	21 days old, 8th generation	196 days	1121	2,020	1,300	Nov. 27th, 1906	Died 53 days	General tuberculosis.
P. XLII.	Original material	21 days old, 8th generation	177 days	1073	700	800	Nov. 17th, 1906	Died 46 days	General tuberculosis.
P. XLIII.	Original material	21 days old, 6th generation	169 days	1130	1,350	1,270	Nov. 28th, 1906	Died 60 days	General tuberculosis. Inoculation partly intra-caecal.
P. XLVII.	Original material	21 days old, 8th generation	183 days	1139	1,340	1,250	Dec. 4th, 1906	Died 25 days	General tuberculosis.
P. XLIX.	Original material	21 days old, 6th generation	157 days	1204	1,100	740	Jan. 19th, 1907	Died 48 days	General tuberculosis.
P. L.	Original material	25 days old, 7th generation	141 days	1175	1,120	950	Jan. 3rd, 1907	Died 40 days	General tuberculosis.
P. LI.	Original material	16 days old, 5th generation	95 days	1193	2,100	1,420	Jan. 18th, 1907	Died 32 days	General tuberculosis.
P. LII.	Original material	20 days old, 5th generation	95 days	1198	2,100	1,700	Jan. 18th, 1907	Died 25 days	General tuberculosis.

DOSE IN EACH CASE: 0·01 milligramme.

P. I.	Original material	21 days old, 8th generation	138 days	371	800	720	July 19th, 1905	Died 27 days	General tuberculosis.
P. V.	Original material	20 days old, 7th generation	134 days	400	850	640	Aug. 30th, 1905	Died 30 days	General tuberculosis.
P. VI.	Guinea-pig 1515	20 days old, 6th generation	126 days	407	1,190	890	Sept. 1st, 1905	Died 36 days	General tuberculosis.
P. VII.	Original material	20 days old, 8th generation	144 days	459	1,240	950	Sept. 18th, 1905	Died 25 days	General tuberculosis.
P. VIII.	Original material	20 days old, 5th generation	117 days	429	1,030	920	Sept. 5th, 1905	Died 32 days	General tuberculosis.
P. X.	Original material	21 days old, 5th generation	116 days	451	1,030	900	Sept. 11th, 1905	Died 47 days	General tuberculosis.
P. XI.	Original material	20·5 days old, 4th generation	97 days	442	1,070	820	Sept. 6th, 1905	Died 29 days	General tuberculosis.
P. XII.	Guinea-pig 1636	20 days old, 5th generation	101 days	602	1,010	900	Dec. 14th, 1905	Died 75 days	General tuberculosis. Inoculation partly subcutaneous.
P. XIII.	Original material	21 days old, 6th generation	116 days	508	1,950	1,450	Oct. 30th, 1905	Died 33 days	General tuberculosis.
P. XIV.	Guinea-pig 1623	21 days old, 6th generation	139 days	696	810	630	Jan. 29th, 1906	Died 9 days	Death from psorospermosis of liver.
P. XV.	Original material	20 days old, 8th generation	114 days	532	1,740	1,280	Nov. 23rd, 1905	Died 28 days	General tuberculosis.
P. XVI.	Original material	20 days old, 5th generation	100 days	526	1,590	1,150	Nov. 22nd, 1905	Died 38 days	General tuberculosis.
P. XVII.	Original material	20 days old, 6th generation	123 days	611	1,090	820	Dec. 15th, 1905	Died 52 days	General tuberculosis.
P. XVIII.	Original material	20 days old, 6th generation	119 days	583	1,220	1,000	Dec. 11th, 1905	Died 23 days	General tuberculosis.
P. XIX.	Original material	20 days old, 6th generation	128 days	620	1,250	870	Dec. 20th, 1905	Died 41 days	General tuberculosis.

SUBCUTANEOUS INOCULATIONS OF RABBITS WITH CULTURES OF VIRULENT TUBERCLE BACILLI OF PORCINE ORIGIN.

Dose in each case: 10·0 milligrammes.

Virus.	Source of Culture.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Number of Rabbit.	Weight in Grammes.		Date of Inoculation.	Duration of Life.	Result.
					Initial.	Final.			
P. IX.	Original material	20 days old, 7th generation	125 days	465	1,250	1,020	Sept. 20th, 1905	Died 28 days	General tuberculosis.
P. XIV.	Original material	21 days old, 21st generation	581 days	1292	1,300	1,180	April 16, 1907	Died 99 days	General tuberculosis.
P. XIV.	Original material	21 days old, 23rd generation	672 days	1409	1,770	1,990	July 16, 1907	Died 201 days	General tuberculosis,
P. XXXVII.	Original material	21 days old, 10th generation	245 days	1104	760	800	Nov. 23rd, 1906	Died 31 days	General tuberculosis.
P. XXXVIII.	Original material	21 days old, 8th generation	193 days	1109	2,250	1,850	Nov. 24th, 1906	Died 87 days	General tuberculosis.
P. XXXIX.	Original material	21 days old, 6th generation	196 days	1114	1,290	1,100	Nov. 27th, 1906	Died 63 days	General tuberculosis.
P. XL.	Original material	21 days old, 8th generation	196 days	1118	1,910	1,240	Nov. 27th, 1906	Died 77 days	General tuberculosis.
P. XLII.	Original material	21 days old, 8th generation	177 days	1070	1,550	1,200	Nov. 17th, 1906	Died 51 days	General tuberculosis.
P. XLIX.	Original material	21 days old, 6th generation	157 days	1206	2,200	1,640	Jan. 18th, 1907	Died 40 days	General tuberculosis.
P. L.	Original material	25 days old, 7th generation	141 days	1178	1,620	1,100	Jan. 3rd, 1907	Died 77 days	General tuberculosis.
P. LIII.	Original material	21 days old, 8th generation	185 days	1395	2,200	1,550	July 15th, 1907	Died 32 days	General tuberculosis.
P. LIV.	Original material	21 days old, 7th generation	185 days	1401	1,870	1,270	July 15th, 1907	Died 54 days	General tuberculosis.
P. LV.	Original material	22 days old, 7th generation	186 days	1405	2,440	1,680	July 16th, 1907	Died 44 days	General tuberculosis.
P. LVI.	Original material	21 days old, 5th generation	143 days	1439	1,800	1,390	Sept. 9th, 1907	Died 55 days	General tuberculosis.
P. LVII.	Original material	21 days old, 5th generation	117 days	1450	1,810	1,370	Sept. 10th, 1907	Died 64 days	General tuberculosis.
P. LVIII.	Original material	21 days old, 6th generation	129 days	1497	2,470	1,990	Oct. 3, 1907	Died 29 days	General tuberculosis.
P. LIX.	Original material	21 days old, 6th generation	119 days	1495	2,130	1,800	Oct. 2, 1907	Died 38 days	General tuberculosis.
P. LX.	Original material	14 days old, 6th generation	118 days	1492	2,200	1,350	Oct. 1, 1907	Died 101 days	General tuberculosis.
P. LXII.	Original material	21 days old, 5th generation	107 days	1515	2,240	1,850	Oct. 14, 1907	Died 63 days	General tuberculosis.
P. LXIII.	Original material	24 days old, 4th generation	94 days	1521	1,840	1,320	Oct. 22, 1907	Died 34 days	General tuberculosis.

DOSE IN EACH CASE: 1·0 milligramme.

P. I.	Original material	21 days old, 8th generation	138 days	365	780	920	July 19th, 1905	Died 73 days	General tuberculosis.
P. V.	Original material	20 days old, 7th generation	134 days	395	1,800	1,210	Aug. 30th, 1905	Died 88 days	General tuberculosis.
P. VI.	Guinea-pig 1515	20 days old, 6th generation	126 days	402	1,700	1,300	Sept. 1st, 1905	Died 71 days	General tuberculosis.
P. VII.	Original material	20 days old, 8th generation	144 days	454	1,650	1,380	Sept. 18th, 1905	Died 61 days	General tuberculosis.
P. VIII.	Original material	20 days old, 5th generation	117 days	425	1,420	1,520	Sept. 5th, 1905	Died 62 days	General tuberculosis.
P. IX.	Original material	20 days old, 7th generation	125 days	467	1,450	1,300	Sept. 20th, 1905	Died 51 days	General tuberculosis.
P. X.	Original material	21 days old, 5th generation	116 days	447	1,250	1,370	Sept. 11th, 1905	Died 84 days	General tuberculosis.
P. XI.	Original material	20·5 days old, 4th generation	97 days	437	2,120	1,590	Sept. 6th, 1905	Died 120 days	General tuberculosis.
P. XII.	Guinea-pig 1636	20 days old, 5th generation	101 days	599	1,400	1,150	Dec. 14th, 1905	Died 97 days	General tuberculosis.
P. XIV.	Guinea-pig 1623	21 days old, 6th generation	129 days	697	1,350	870	Jan. 29th, 1906	Died 16 days	Small local lesion and caseous foci in the nearest glands only.
P. XIV.	Original material	12 days old, 21st generation	581 days	1308	2,220	1,420	April 16, 1907	Died 72 days	General tuberculosis.
P. XIV.	Original material	21 days old, 23rd generation	672 days	1408	1,300	1,320	July 16, 1907	Died 177 days	General tuberculosis.
P. XVII.	Original material	20 days old, 6th generation	123 days	616	1,250	1,000	Dec. 15th, 1905	Died 165 days	General tuberculosis.
P. XVIII.	Original material	20 days old, 6th generation	119 days	588	1,450	1,120	Dec. 11th, 1905	Died 79 days	General tuberculosis.
P. XIX.	Original material	20 days old, 6th generation	128 days	621	1,440	1,020	Dec. 20th, 1905	Died 57 days	General tuberculosis.
P. XX.	Original material	21 days old, 5th generation	85 days	788	1,200	700	Feb. 23rd, 1906	Died 73 days	General tuberculosis.
P. XXII.	Original material	21 days old, 4th generation	77 days	604	1,040	1,150	Dec. 14th, 1905	Died 52 days	General tuberculosis.
P. XXIII.	Original material	21 days old, 6th generation	116 days	669	1,040	750	Jan. 23rd, 1906	Died 54 days	General tuberculosis.
P. XXIV.	Guinea-pig 1790	20 days old, 3rd generation	102 days	806	1,450	870	Mar. 20th, 1906	Died 86 days	General tuberculosis.
P. XXV.	Original material	6 days old, 6th generation	75 days	782	1,160	800	Feb. 22nd, 1906	Died 20 days	Caseous local lesion, opaque foci in the nearest glands, and one focus in the spleen.
	Original material			783	1,180	770		Died 70 days	General tuberculosis.
P. XXVI.	Original material	22 days old, 6th generation	126 days	831	1,410	2,280	April 13th, 1906	Killed 136 days	Chronic generalized tuberculosis.
P. XXIX.	Original material	21 days old, 5th generation	114 days	821	1,370	930	April 13th, 1906	Died 75 days	General tuberculosis.
P. XXX.	Original material	19 days old, 6th generation	132 days	855	1,600	1,020	May 1st, 1906	Died 57 days	General tuberculosis.
P. XXXI.	Original material	20 days old, 6th generation	140 days	865	1,700	980	May 9th, 1906	Died 70 days	General tuberculosis.

SUBCUTANEOUS INOCULATIONS OF RABBITS WITH CULTURES OF VIRULENT TUBERCLE BACILLI OF PORCINE ORIGIN—*continued.*

DOSE IN EACH CASE: 1·0 milligramme—*continued.*

Virus.	Source of Culture.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Number of Rabbit.	Weight in Grammes.		Date of Inoculation.	Duration of Life.	Result.
					Initial.	Final.			
P. XXXII.	Original material	21 days old, 7th generation	143 days	**970**	1,600	1,850	July 5th, 1906	Died 97 days	General tuberculosis.
P. XXXIII.	Original material	22 days old, 7th generation	140 days	**975**	1,100	1,100	July 5th, 1906	Died 94 days	General tuberculosis.
P. XXXIV.	Original material	22 days old, 7th generation	140 days	**982**	1,150	1,160	July 6th, 1906	Died 72 days	General tuberculosis.
P. XXXVI.	Original material	21 days old, 10th generation	245 days	**1098**	730	900	Nov. 23rd, 1906	Died 75 days	General tuberculosis.
P. XXXVII.	Original material	21 days old, 10th generation	245 days	**1103**	580	820	Nov. 23rd, 1906	Died 64 days	General tuberculosis.
P. XXXVIII.	Original material	21 days old, 8th generation	193 days	**1110**	2,400	—	Nov. 24th, 1906	Died 75 days	General tuberculosis.
P. XXXIX.	Original material	21 days old, 6th generation	196 days	**1112**	1,190	1,260	Nov. 27th, 1906	Died 75 days	General tuberculosis.
P. XL	Original material	21 days old, 8th generation	196 days	**1119**	1,760	1,520	Nov. 27th, 1906	Died 69 days	General tuberculosis.
P. XLII.	Original material	21 days old, 8th generation	177 days	**1069**	1,600	1,400	Nov. 17th, 1906	Died 49 days	General tuberculosis.
P. XLVII.	Original material	21 days old, 8th generation	183 days	**1142**	1,120	1,100	Dec. 4th, 1906	Died 86 days	General tuberculosis.
P. XLIX.	Original material	21 days old, 6th generation	157 days	**1207**	1,350	1,200	Jan. 19th, 1907	Died 40 days	General tuberculosis.
P. L.	Original material	25 days old, 7th generation	141 days	**1177**	1,920	1,380	Jan. 3rd, 1907	Died 67 days	General tuberculosis.
P. LI.	Original material	16 days old, 5th generation	95 days	**1195**	1,700	1,400	Jan. 18th, 1907	Died 56 days	General tuberculosis
P. LII.	Original material	20 days old, 5th generation	95 days	**1200**	1,900	1,720	Jan. 18th, 1907	Died 46 days	General tuberculosis.
	Original material			**1201**	2,350	1,900		Died 69 days	General tuberculosis.
P. LIII.	Original material	21 days old, 8th generation	185 days	**1394**	2,650	2,000	July 15th, 1907	Died 29 days	General tuberculosis, acute. Inoculation intra-muscular.
P. LIV.	Original material	21 days old, 7th generation	185 days	**1400**	1,870	1,510	July 15th, 1907	Died 53 days	General tuberculosis.
P. LV.	Original material	22 days old, 7th generation	186 days	**1404**	2,240	1,780	July 16th, 1907	Died 58 days	General tuberculosis.
P. LVI.	Original material	21 days old, 5th generation	143 days	**1438**	1,640	1,650	Sept. 9th, 1907	Died 38 days	General tuberculosis.
P. LVII.	Original material	21 days old, 5th generation	117 days	**1451**	1,390	1,420	Sept. 10th, 1907	Died 46 days	General tuberculosis.
P. LVIII.	Original material	21 days old, 6th generation	129 days	**1499**	2,460	1,630	Oct. 3rd, 1907	Died 48 days	General tuberculosis.
P. LIX.	Original material	21 days old, 6th generation	119 days	**1493**	1,820	1,220	Oct. 2nd, 1907	Died 71 days	General tuberculosis.

P. LX.	Original material	14 days old, 6th generation	118 days	1490	1,670	1,110	Oct. 1st, 1907	Died 72 days	General tuberculosis.
P. LXI.	Original material	14 days old, 8th generation	121 days	1528	1,500	1,300	Oct 28th, 1907	Died 58 days	General tuberculosis.
				1529	1,620	1,100		Died 50 days	General tuberculosis.
P. LXII.	Original material	21 days old, 5th generation	107 days	1512	2,000	1,520	Oct. 14th, 1907	Died 63 days	General tuberculosis.
P. LXIII.	Original material	24 days old, 4th generation	94 days	1523	1,780	1,600	Oct. 22nd, 1907	Died 66 days	General tuberculosis.

DOSE IN EACH CASE : 0·1 milligramme.

P. I.	Original material	21 days old, 8th generation	138 days	368	790	920	July 19th, 1905	Died 74 days	General tuberculosis.
P. V.	Original material	20 days old, 7th generation	134 days	396	1,400	1,550	Aug. 30th, 1905	Died 58 days	General tuberculosis.
P. VI.	Guinea-pig 1,515	20 days old, 6th generation	126 days	406	1,270	1,250	Sept. 1st, 1905	Died 88 days	General tuberculosis.
P. VII.	Original material	20 days old, 8th generation	144 days	458	1,220	1,540	Sept. 18th, 1905	Died 36 days	Early general tuberculosis, death due to enteritis.
P. VIII.	Original material	20 days old, 5th generation	117 days	428	1,060	950	Sept. 5th, 1905	Died 87 days	General tuberculosis.
P. IX.	Original material	20 days old, 7th generation	125 days	470	1,370	1,000	Sept. 20th, 1905	Died 80 days	General tuberculosis.
P. X.	Original material	21 days old, 5th generation	116 days	450	1,140	1,100	Sept. 11th, 1905	Died 88 days	General tuberculosis.
P. XI.	Original material	20·5 days old, 4th generation	97 days	441	1,170	950	Sept. 6th, 1905	Died 62 days	General tuberculosis.
P. XII.	Guinea-pig 1,636	20 days old, 5th generation	101 days	603	1,200	1,050	Dec. 14th, 1905	Died 105 days	General tuberculosis.
P. XIII.	Original material	21 days old, 6th generation	116 days	510	2,100	1,600	Oct. 30th, 1905	Died 53 days	General tuberculosis.
P. XV.	Original material	20 days old, 8th generation	114 days	534	1,720	1,900	Nov. 23rd, 1905	Died 39 days	Early general tuberculosis, death due to septic peritonitis.
P. XVI.	Original material	20 days old, 5th generation	100 days	528	1,680	1,180	Nov. 22nd, 1905	Died 102 days	General tuberculosis.
P. XVII.	Original material	20 days old, 6th generation	123 days	614	1,020	1,100	Dec. 15th, 1905	Died 100 days	General tuberculosis.
P. XVIII.	Original material	20 days old, 6th generation	119 days	587	1,390	1,080	Dec. 11th, 1905	Died 93 days	General tuberculosis.
P. XIX.	Original material	20 days old, 6th generation	128 days	624	1,440	1,120	Dec. 20th, 1905	Died 82 days	General tuberculosis.
P. XX.	Original material	21 days old. 5th generation	85 days	785	900	650	Feb. 23rd, 1906	Died 33 days	Early general tuberculosis, ? cause of death.
P. XXII.	Original material	21 days old, 4th generation	77 days	605	960	920	Dec. 14th, 1905	Died 133 days	General tuberculosis.
	Rabbit 483	20 days old, 5th generation	77 days	704	1,230	1,100	Feb. 2nd, 1906	Died 33 days	Early general tuberculosis. Psorospermosis of liver.
P. XXIII.	Original material	21 days old, 6th generation	116 days	672	1,240	1,100	Jan. 22nd, 1906	Died 87 days	General tuberculosis.

SUBCUTANEOUS INOCULATIONS OF RABBITS WITH CULTURES OF VIRULENT TUBERCLE BACILLI OF PORCINE ORIGIN—*continued.*

DOSE IN EACH CASE: 0·1 milligramme—*continued.*

Virus.	Source of Culture.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Number of Rabbit.	Weight in Grammes.		Date of Inoculation.	Duration of Life.	Result.
					Initial.	Final.			
P. XXIV.	Guinea-pig 1,790	20 days old, 3rd generation	102 days	808	870	840	March 20th, 1906	Died 74 days	General tuberculosis.
P. XXV.	Original material	6 days old, 6th generation	75 days	784	1,020	870	Feb. 22nd, 1906	Died 56 days	General tuberculosis.
P. XXVI.	Original material	22 days old, 6th generation	126 days	827	1,370	1,440	April 13th, 1906	Died 90 days	General tuberculosis.
P. XXIX.	Original material	21 days old, 5th generation	114 days	822	1,300	1,060	April 13th, 1906	Died 126 days	General tuberculosis.
P. XXX.	Original material	19 days old, 6th generation	132 days	856	1,560	1,120	May 1st, 1906	Died 55 days	General tuberculosis.
P. XXXI.	Original material	20 days old, 6th generation	140 days	866	1,100	820	May 9th, 1906	Died 74 days	General tuberculosis.
P. XXXII.	Original material	21 days old, 7th generation	143 days	968	1,520	1,150	July 5th, 1906	Died 98 days	General tuberculosis.
P. XXXIV.	Original material	22 days old, 7th generation	140 days	981	1,070	1,050	July 6th, 1906	Died 146 days	General tuberculosis.
P. XXXVI.	Original material	21 days old, 10th generation	245 days	1097	720	760	Nov. 23rd, 1906	Died 69 days	General tuberculosis.

DOSE IN EACH CASE: 0·01 milligramme.

P. XII.	Guinea-pig 1,636	20 days old, 5th generation	101 days	601	1,140	900	Dec. 14th, 1905	Died 89 days	General tuberculosis.
P. XIII.	Original material	21 days old, 6th generation	116 days	506	1,820	1,490	Oct. 30th, 1905	Died 69 days	General tuberculosis.
P. XIV.	Original material	21 days old, 12th generation	290 days	698	850	700	June 29, 1906	Died 58 days	General tuberculosis.
P. XV.	Original material	20 days old, 8th generation	114 days	530	1,180	1,270	Nov. 23rd, 1905	Died 46 days	Early general tuberculosis; death due to enteritis.
P. XVI.	Original material	20 days old, 5th generation	100 days	524	1,340	1,190	Nov. 22nd, 1905	Died 70 days	General tuberculosis.
P. XVII.	Original material	20 days old, 6th generation	123 days	612	1,090	890	Dec. 15th, 1905	Died 74 days	General tuberculosis.
P. XVIII.	Original material	20 days old, 6th generation	119 days	586	1,230	1,070	Dec. 11th, 1905	Died 125 days	General tuberculosis.
P. XIX.	Original material	20 days old, 6th generation	128 days	625	1,090	880	Dec. 20th, 1905	Died 91 days	General tuberculosis

P. XX.	Original material	21 days old, 5th generation	85 days	**787**	1,100	890	Feb. 23rd, 1906	Died 28 days	Caseous local tumour, a few foci in the nearest glands, and one tubercle in the lung.
P. XXII.	Rabbit 483	20 days old, 5th generation	77 days	**705**	1,050	870	Feb. 2nd, 1906	Died 88 days	General tuberculosis.
P. XXIII.	Original material	21 days old, 6th generation	116 days	**673**	990	1,040	Jan. 22nd, 1906	Died 122 days	General tuberculosis.
P. XXIV.	Guinea-pig 1,790	20 days old, 3rd generation	102 days	**805**	970	760	Mar. 20th, 1906	Died 107 days	General tuberculosis.
P. XXVI.	Original material	22 days old, 6th generation	126 days	**828**	1,300	740	Apr. 13th, 1906	Died 77 days	General tuberculosis.
P. XXIX.	Original material	21 days old, 5th generation	114 days	**823**	1,230	850	Apr. 13th, 1906	Died 80 days	General tuberculosis.

INTRAVENOUS INOCULATIONS OF RABBITS WITH CULTURES OF SLIGHTLY VIRULENT TUBERCLE BACILLI OF PORCINE ORIGIN.

Virus.	Source of Culture.	Dose.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Number of Rabbit.	Weight in Grammes.		Date of Inoculation.	Duration of Life.	Result.
						Initial.	Final.			
P. IV.	Original material.	0·1 mg.	20 days old, 5th generation.	76 days	**307**	1,690	1,960	June 5th, 1905	Killed 86 days.	The lungs contained scattered tubercles up to a millet seed with opaque caseous centres; there were confluent tubercles in the ventral margins and caseous patches on the dorsal surfaces of the caudal lobes. A yellow focus was seen in one bronchial gland; on the surfaces of the kidneys there were discrete tubercles with grey margins and caseous centres which extended as radial streaks through the pyramids. Other organs and glands normal.
P. IV.	Original material.	1·0 mg.	20 days old, 5th generation.	76 days	**308**	1,850	1,640	June 5th, 1905	Killed 87 days.	The margins of the lungs were caseous and almost the whole of the dorsal surface of the left caudal lobe was covered with a caseous patch 5 mm. in greatest thickness. The kidneys were similar in appearance to those of Rabbit 307; radial section showed several broad streaks extending from cortex through the medulla.
P. IV.	Original material.	1·0 mg.	21 days old, 11th generation.	183 days	**461**	1,970	1,940	September 20th, 1905.	Killed 90 days.	The lungs contained fairly numerous nodules varying from a pinhead up to 3 mm. in diameter; they were firm, grey, projecting, and the largest were almost entirely caseous and slightly gritty. On the dorsal surface of the left caudal lobe extending almost the whole length and 1 cm. in width there was a firm grey nodule speckled with yellow gritty foci, and a smaller similar nodule was seen in the left. The cephalic lobes were almost replaced by firm grey nodules. There was a soft caseous tubercle in a bronchial gland. The kidneys showed on the surfaces scattered round nodules up to 2 mm. in diameter; the centres were composed of soft caseous substance which extended as streaks through the pyramids. Other organs and glands normal.

INTRAVENOUS INOCULATIONS OF RABBITS WITH CULTURES OF SLIGHTLY VIRULENT TUBERCLE BACILLI OF PORCINE ORIGIN—*continued.*

Virus.	Source of Culture.	Dose.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Number of Rabbit.	Weight in Grammes.		Date of Inoculation.	Duration of Life.	Result.
						Initial.	Final.			
P. XLI.	Original material.	0·1 mg.	21 days old, 8th generation.	175 days	**1051**	2,150	2,400	November 15th, 1906.	Killed 99 days.	Spleen normal ; in the cortex of each kidney there were three grey miliary tubercles with soft caseous centres, and a soft caseous streak was seen in the medulla of one kidney. The lungs were crepitant and contained sparsely scattered minute translucent tubercles, a few opaque in the centre. In the left testis there was a soft caseous nodule which contained numerous tubercle bacilli. Other organs and the lymphatic glands were normal.
P. XLI.	Original material.	1·0 mg.	21 days old, 8th generation.	175 days	**1052**	1,950	1,600	November 15th, 1906.	Died 11 days.	No visible tuberculosis ; tubercle bacilli found in smear preparations of lung, liver, and spleen.
P. XLI.	Lung of Pig 166.	0·1 mg.	20 days old, 7th generation.	136 days	**1479**	1,130	2,770	September 20th, 1907.	Killed 129 days.	In the lungs which were pink and crepitant, there were a few caseous tubercles and reddish grey marginal nodules. Each kidney showed on the surface a reddish grey depressed patch beset with caseous foci, and on section there was a soft caseous streak passing from it through the pyramids. No disease elsewhere.
P. XLI.	Lung of Pig 166.	1·0 mg.	20 days old, 7th generation.	136 days	**1481**	1,200	1,160	September 20th, 1907.	Killed 129 days.	In the lung just beneath the pleura, there were a few minute caseous tubercles. The kidneys showed a few grey nodules with soft yellow centres in the cortices and several streaks in the pyramids. No disease elsewhere.
P. XLI.	Lung of Pig 258.	0·01 mg.	21 days old, 2nd generation.	35 days	**1861**	800	1,100	July 28th, 1908	Killed 100 days.	The caudal lobes of the lungs contained grey nodules beset with yellow caseous foci. In the kidneys there were one or two caseating submiliary tubercles. No disease elsewhere.
P. XLI.	Lung of Pig 258.	0·1 mg.	21 days old, 2nd generation.	35 days	**1862**	1,000	1,770	July 28th, 1908	Killed 101 days.	The lungs showed sparsely scattered translucent foci and two caseous gritty patches at one caudal extremity. A few opaque foci in the liver and spleen. The pyramids of the kidneys contained several grey tubercles and soft caseous streaks.
P. XLI.	Lung of Pig 258.	1·0 mg.	21 days old, 2nd generation.	35 days	**1863**	850	620	July 28th, 1908	Died 27 days.	The lungs were congested and oedematous, and the substance was beset with indefinite grey tubercles, with a few opaque points. Spleen swollen. A few grey points on the liver. The cortices of the kidneys were filled with ill-defined grey foci. Caseous foci in the bronchial and portal glands.
P. XLVI.	Original material.	0·1 mg.	21 days old, 7th generation.	136 days	**1046**	2,600	2,650	November 15th, 1906.	Killed 100 days.	In the spleen there was one opaque focus. Kidneys contained a few grey tubercles with caseous centres in the cortices and caseous streaks in the pyramids ; the pelvis of the left kidney was filled with muco-pus. On the surface of the lungs there were scattered grey nodules with soft caseous centres up to a wheat grain. Caseous focus in a mediastinal gland. No tuberculosis elsewhere.
P. XLVI.	Original material.	1·0 mg.	21 days old, 7th generation.	136 days	**1045**	2,950	2,900	November 15th, 1906	Killed 100 days.	Spleen showed a few grey foci ; in the cortices of the kidneys there were a few grey tubercles up to a millet seed with opaque centres. Lungs pink and crepitant contained a few translucent tubercles and one marginal grey nodule with softening caseous centre. There were caseous foci in the mammary gland beneath each nipple in which were moderately numerous tubercle bacilli. No disease elsewhere.

INTRAPERITONEAL INOCULATIONS OF RABBITS WITH CULTURES OF SLIGHTLY VIRULENT TUBERCLE BACILLI OF PORCINE ORIGIN.

P. IV.	Original material.	1·0 mg.	20 days old. 5th generation.	76 days	314	790	1,300	June 5th, 1905	Died 333 days.	In the omentum and on the peritoneum there were slightly gritty caseo-purulent nodules. Spleen normal. The surfaces of the kidneys were pitted, and showed numerous grey tubercles up to 3 mm. in diameter with caseous centres. On the pleural surface of the diaphragm there was a thick mass of firm fibro-caseous nodules, and also large caseous nodules on the pericardium and between the heart and diaphragm. The lungs filled the pleural cavities; the right-posterior lobe consisted of a caseo-purulent cyst, and there were three similar cysts up to the size of a pigeon's egg in the left lung; the rest of the substance was filled with caseous nodules with confluent grey margins, leaving very little lung tissue. Flattened caseous masses on the parietal pleura; caseous nodules in mediastinal and axillary glands; and opaque foci in the mesenteric. A small tubercle in the left thyroid lobe.
P. IV.	Original material.	1·0 mg.	20 days old, 5th generation.	76 days	312	1,540	2,350	June 5th, 1905	Killed 91 days.	Caseo-purulent nodule in the subcutaneous tissue, and a caseous focus in each of the nearest glands. Pinhead-sized tubercles in the omentum. The lungs were crepitant, and contained moderately numerous hard grey tubercles up to 3 mm. in diameter with softened caseous centres. Other organs and glands normal.
P. IV.	Original material.	1·0 mg.	21 days old, 11th generation.	183 days	462	1,770	1,950	September 20th. 1905.	Killed 90 days.	In the omentum there were moderately numerous pinhead-sized tubercles; on the peritoneum there were scattered opaque miliary tubercles, some gritty in the centre. The kidneys showed several projecting nodules up to 4 mm. in diameter; some were soft and caseous in the centres, and extended as radial streaks; the right pelvis was filled with curdy caseo-pus. Lungs were crepitant and contained a moderate number of hard grey miliary tubercles with caseous centres and a few larger grey nodules. Other organs and glands normal.
P. IV.	Original material.	1·0 mg.	21 days old, 11th generation.	183 days	463	1,750	1,220	September 20th. 1905.	Died 18 days.	Omentum slightly thickened and composed of pinkish-grey and caseated tissues. Peritoneum closely covered with minute greyish-white tubercles. The spleen was enlarged, and the malpighian bodies prominent, but there were no tubercles. The liver showed moderately numerous grey points, and the kidneys a few. The lungs were congested, and showed numerous minute grey tubercles about 5 mm. in diameter, only one caseous in the centre. Caseous foci and patches in the portal, coeliac, mesenteric and bronchial glands. A few tubercle bacilli were demonstrated in the spleen and liver.
P. IV.	Original material.	10 mg.	20 days old, 5th generation.	76 days	310	1,590	1,600	June 5th, 1905	Killed 87 days.	Caseo-purulent cyst in the subcutaneous tissue at the seat of inoculation. There were a few soft caseous nodules, one the size of a thrush's egg, in the omentum, and similar nodules in the small omentum, on the bladder and rectum, and in the lumbar regions. On the mesentery there were groups of confluent grey tubercles. On the surfaces of the liver and spleen there were a few tubercles, but the substance of both was normal. In the cortices of the kidneys there were scattered caseous tubercles. In the lungs there were discrete miliary caseous tubercles coalescing to form patches on the surfaces of the caudal lobes and in the margins.

INTRAPERITONEAL INOCULATIONS OF RABBITS WITH CULTURES OF SLIGHTLY VIRULENT TUBERCLE OF PORCINE ORIGIN—*continued.*

Virus.	Source of Culture.	Dose.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Number of Rabbit.	Weight in Grammes.		Date of Inoculation.	Duration of Life.	Result.
						Initial.	Final.			
P. XLI.	Original material.	1·0 mg.	21 days old. 8th generation.	175 days	**1053**	2,300	1,450	November 15th, 1906.	Died 23 days.	Slight tuberculosis of the omentum and peritoneum. A few grey foci in the lungs and kidneys in which no tubercle bacilli were demonstrated. A few opaque foci in the mediastinal glands. No tuberculosis elsewhere.
P. XLI.	Original material.	1·0 mg.	21 days old, 10th generation.	245 days	**1213**	1,300	1,060	January 24th, 1907.	Died 40 days.	Slight tuberculosis of omentum and peritoneum. On the surface of the lungs there were a few translucent tubercles with caseous centres. The cortices of the kidneys showed minute pits with one caseous streak in the medulla. Caseous tubercles in the mediastinal and portal glands. No tuberculosis elsewhere.
P. XLI.	Original material.	10 mg.	21 days old, 8th generation.	175 days	**1054**	2,550	2,570	November 15th, 1906.	Killed 99 days.	Omentum contained discrete grey nodules, with soft, caseous, slightly-gritty centres, and cysticerci filled with caseo-pus. There were similar scattered nodules on the peritoneum. The cortices of the kidneys showed a moderate number of grey nodules filled with caseo-pus, many extending as soft caseous streaks through the pyramids; the pelvis of one kidney was filled with caseo-pus. The lungs showed a few minute grey tubercles and one small caseous nodule. Soft caseous nodules in the sternal and mediastinal glands.
P. XLVI.	Original material.	1·0 mg.	21 days old, 7th generation.	136 days	**1047**	3,400	3,500	November 15th, 1906.	Killed 100 days.	In the omentum and on the peritoneum there were a few translucent tubercles with soft caseous centres. A grey miliary nodule was seen in the spleen. In the kidneys there were a few grey tubercles with caseous centres, and also two projecting nodules up to a small pea in size. The lungs contained scattered grey tubercles, and also three nodules up to 1 cm. in diameter, consisting of grey capsules filled with caseo-pus; the margins of the posterior lobes were replaced by grey tissue with caseous foci. No disease elsewhere.
P. XLVI.	Original material.	10 mg.	21 days old, 7th generation.	136 days	**1048**	2,900	2,650	November 15th, 1906.	Killed 100 days.	In the omentum and peritoneum there were moderately numerous flat grey nodules with caseous centres up to a hemp seed. Spleen and liver normal. The kidneys showed on the surface scattered translucent nodules up to 4 mm., which on section contained soft caseous substance; these extended as caseous streaks through the pyramids. Opaque gritty foci in a lumbar gland. Lungs collapsed normally and showed moderately numerous flat grey nodules with caseous foci on the surface and in the margins. Caseo-purulent nodule in a mediastinal gland.

SUBCUTANEOUS INOCULATIONS OF RABBITS WITH CULTURES OF SLIGHTLY VIRULENT TUBERCLE BACILLI OF PORCINE ORIGIN.

P. IV.	Original material.	0·1 mg.	20 days old, 5th generation.	76 days	313	870	920	June 5th, 1905	Killed 88 days.	Caseo-purulent local lesion. In each lung there were about half-a-dozen caseous nodules with grey margins. No tuberculosis elsewhere.
P. IV.	Original material.	1·0 mg.	20 days old, 5th generation.	76 days	311	1,510	1,940	June 5th, 1905	Killed 88 days.	Caseo-purulent local lesion. Soft caseous nodules in the inguinal glands. In the lungs there were about three dozen irregular nodules up to 2·5 mm.; they were caseous in the centre, some being softened, and were situated mainly under the pleura. Other organs and glands normal.
P. IV.	Original material.	10 mg.	20 days old, 5th generation.	76 days	309	1,700	2,220	June 5th, 1905	Killed 88 days.	Caseo-purulent cyst in the subcutaneous tissue. In the lungs there were scattered nodules with little caseation varying in size from a millet seed up to 1 cm. in diameter. Other organs and lymphatic glands normal.
P. IV.	Original material.	10 mg.	21 days old, 11th generation.	183 days	464	1,270	1,410	September 20th, 1905.	Killed 90 days.	Small ulcer in the skin and a group of soft caseous nodules in the subcutaneous tissue. Caseo-purulent nodules in the nearest glands. The left kidney showed one yellow tubercle continued as a caseous streak through the pyramids. The lungs contained a few hard grey nodules with very little central caseation, varying up to a small pea in size. No tuberculosis elsewhere.
P. XLI.	Original material.	10 mg.	21 days old. 8th generation.	175 days	1055	1,500	2,200	November 15th, 1906.	Killed 99 days.	Caseo-purulent cyst at the seat of inoculation. On the surface of the lungs there were a few grey tubercles with minute caseous foci. No tuberculosis elsewhere.
P. XLI.	Original material.	50 mg.	21 days old, 8th generation.	175 days	1056	1,950	1,360	November 15th, 1906.	Died 45 days.	Large septic ulcer lined with caseous substance in the skin of back. Soft caseous nodules in axillary glands. A few translucent tubercles on the surface of the lungs. No tuberculosis elsewhere.
P. XLI.	Original material.	100 mg.	21 days old, 10th generation.	245 days	1214	1,270	920	January 24th, 1907.	Died 24 days.	At the seat of inoculation there was a caseo-purulent cyst. No tuberculosis elsewhere. Death due to a strangulated umbilical hernia.
P. XLI.	Lung of Pig 166.	10 mg.	20 days old, 7th generation.	136 days	1478	960	2,330	September 20th, 1907.	Killed 146 days.	Small ulcer in the skin of the back. Right scapular gland contained a few yellow gritty foci. No disease elsewhere.
P. XLI.	Lung of Pig 166.	50 mg.	20 days old, 7th generation.	136 days	1480	1,050	2,350	September 20th, 1907.	Killed 146 days.	In the subcutaneous tissue of the back there was a lobulated cystic tumour: it was filled with soft caseous substance which was discharging through a small ulcer in the skin. No disease elsewhere.
P. XLI.	Lung of Pig 202.	50 mg.	16 days old, 7th generation.	110 days	1701	1,280	1,620	March 12th, 1908.	Killed 174 days.	Cystic local tumour filled with caseo-pus. In the right kidney there was a caseating nodule the size of a hemp seed. On the dorsal surface of the posterior lobes of the lungs there were a few minute tubercles and one firm yellow marginal nodule. No disease elsewhere.
P. XLI.	Lung of Pig 202.	50 mg.	16 days old, 7th generation.	110 days	1702	1,260	2,100	March 12th, 1908.	Killed 174 days.	Caseo-purulent nodule in the subcutaneous tissues of the back. Axillary and scapular glands enlarged and filled with yellow caseo-pus. In each lung there was a soft caseous gritty miliary tubercle. No disease elsewhere.
P. XLI.	Lung of Pig 258.	38 mg.	21 days old, 2nd generation.	35 days	1864	750	1,790	July 28th, 1908.	Killed 100 days.	Caseo-purulent nodules in the subcutaneous tissue of the back. In the lungs, mainly in the caudal margins, there were a few minute translucent tubercles. No tuberculosis elsewhere.
P. XLVI.	Original material.	60 mg.	21 days old, 7th generation.	136 days	1050	2,000	2,150	November 15th, 1906.	Killed 100 days.	Large caseo-purulent cyst in the subcutaneous tissue. A minute grey tubercle in one lung. Other organs and glands were normal.

INOCULATIONS OF RABBITS WITH THE ORIGINAL MATERIAL OF THE PORCINE VIRUSES.

Virus.	Material Used.	Number of Rabbit.	Weight in Grammes.		Method of Inoculation.	Date of Inoculation.	Duration of Life.	Result.
			Initial.	Final.				
P. XV.	Submaxillary gland	381	860	1,020	Intraperitoneal	August 1st, 1905	Died 48 days	General tuberculosis.
P. XX.	Submaxillary gland	554	1,930	1,190	Intraperitoneal	December 1st, 1905	Died 67 days	General tuberculosis.
P. XXII.	Submaxillary gland	483	1,200	1,650	Intraperitoneal	September 29th, 1905	Killed 49 days	Slight tuberculosis.
P. XXIII.	Bronchial gland	484	1,150	800	Intraperitoneal	September 29th, 1905	Died 41 days	General tuberculosis.
P. XXIV.	Submaxillary gland	579	1,330	930	Intraperitoneal	December 8th, 1905	Died 16 days	Slight tuberculosis.
P. XXV.	Submaxillary gland	580	2,220	1,700	Intraperitoneal	December 8th, 1905	Killed 75 days	General tuberculosis.
P. XXVI.	Submaxillary gland	581	1,140	800	Intraperitoneal	December 8th, 1905	Died 18 days	General tuberculosis.
P. XXVIII.	Submaxillary gland	617	1,610	—	Intraperitoneal	December 21st, 1905	Killed 43 days	No tuberculosis.
		618	1,910	1,720	Intravenous		Killed 36 days	No tuberculosis.
P. XXIX.	Submaxillary gland	626	1,570	1,320	Intraperitoneal	December 21st, 1905	Died 30 days	General tuberculosis.
P. XXX.	Submaxillary gland	627	1,530	1,060	Intraperitoneal	December 21st, 1905	Died 60 days	General tuberculosis.
P. XXXI.	Submaxillary gland	628	1,570	1,240	Intraperitoneal	December 21st, 1905	Died 7 days	No tuberculosis.
P. XXXII.	Submaxillary gland	756	1,350	1,100	Subcutaneous	February 13th, 1906	Died 75 days	General tuberculosis.
		757	1,130	1,010	Intraperitoneal		Died 51 days	General tuberculosis.
P. XXXIII.	Submaxillary gland	769	1,170	760	Intraperitoneal	February 17th, 1906	Died 97 days	General tuberculosis.
		770	1,490	1,200	Subcutaneous		Died 108 days	General tuberculosis.
P. XXXIV.	Submaxillary gland	771	1,300	800	Intraperitoneal	February 17th, 1906	Died 119 days	General tuberculosis.
		772	1,360	880	Subcutaneous		Died 123 days	General tuberculosis.
P. XXXV.	Submaxillary gland	796	1,700	1,000	Intravenous	March 9th, 1906	Killed 56 days	No tuberculosis.
P. XXXVI.	Submaxillary gland	811	1,150	1,100	Subcutaneous	March 24th, 1906	Died 93 days	General tuberculosis.
P. XXXVII.	Submaxillary gland	812	1,100	870	Subcutaneous	March 24th, 1906	Died 93 days	General tuberculosis.
P. XLIII.	Submaxillary gland	904	1,820	1,850	Intravenous	June 12th, 1906	Killed 59 days	General tuberculosis.

P. XLV.	Submaxillary gland	943	1,400	—	Intraperitoneal	July 3rd, 1906	Died 10 days	Psoro-spermosis of liver.
P. XLVI.	Submaxillary gland	944	1,700	2,100	Intraperitoneal	July 3rd, 1906	Killed 44 days	No tuberculosis.
P. XLVII.	Submaxillary gland	945	1,750	1,850	Intraperitoneal	July 3rd, 1906	Killed 44 days	General tuberculosis.
P. XLVIII.	Submaxillary gland	946	1,800	2,200	Intraperitoneal	July 3rd, 1906	Killed 44 days	General tuberculosis.
P. LVI.	Lung II.	1315	1,500	1,360	Intraperitoneal	April 20th, 1907	Died 123 days	General tuberculosis.
	Mesenteric gland	1316	1,300	1,050	Subcutaneous		Died 3 days	Acute infection.
	Lung I.	1317	1,050	960	Subcutaneous		Died 125 days	General tuberculosis.
P. LVII.	Submaxillary gland	1336	1,050	870	Intraperitoneal	May 17th, 1907	Died 71 days	General tuberculosis.
	Bronchial gland	1337	980	770	Intraperitoneal		Died 5 days	Psorospermosis of liver. No tuberculosis.
		1338	1,140	1,310	Subcutaneous		Died 104 days	General tuberculosis.
	Mesenteric gland	1339	1,050	1,200	Intraperitoneal		Killed 106 days	Chronic general tuberculosis.
P. LVIII.	Spleen	1346	1,550	2,050	Intraperitoneal	May 28th, 1907	Died 68 days	Early general tuberculosis.
	Liver	1347	1,110	820	Intraperitoneal		Died 9 days	No tuberculosis.
P. LIX.	Submaxillary gland	1363	1,650	1,370	Intraperitoneal	June 6th, 1907	Died 86 days	General tuberculosis.
	Synovial membrane	1364	1,050	1,620	Intraperitoneal		Died 98 days	General tuberculosis.
P. LX.	Bronchial gland	1365	1,300	1,320	Intraperitoneal	June 6th, 1907	Died 48 days	General tuberculosis.
	Spleen	1366	1,550	1,800	Intraperitoneal		Killed 85 days	Early general tuberculosis.
P. LXI.	Bronchial gland	1375	1,920	1,640	Intraperitoneal	June 29th, 1907	Died 96 days	General tuberculosis.
	Portal gland	1376	1,200	1,160	Intraperitoneal		Died 53 days	General tuberculosis.
P. LXII.	Spleen	1377	1,770	1,750	Intraperitoneal	June 29th, 1907	Died 92 days	General tuberculosis.
	Lung	1378	1,470	1,590	Intraperitoneal		Died 122 days	General tuberculosis.

INTRAPERITONEAL INOCULATIONS OF GUINEA-PIGS WITH CULTURES OF VIRULENT TUBERCLE BACILLI OF PORCINE ORIGIN.

Dose in each case: 1·0 milligramme.

Virus.	Source of Culture.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Number of Guinea-pig.	Weight in Grammes.		Date of Inoculation.	Duration of Life.	Result.
					Initial.	Final.			
P. XII.	Guinea-pig 1636	21 days old, 9th generation	298 days	**2123**	470	300	June 29th, 1906	Died 11 days	General tuberculosis.
P. XXXVI.	Original material	21 days old, 10th generation	245 days	**2225**	450	280	Nov. 23rd, 1906	Died 12 days	General tuberculosis.
P. XXXVII.	Original material	21 days old, 10th generation	245 days	**2229**	400	270	Nov. 23rd, 1906	Died 10 days	General tuberculosis.
P. XXXVIII.	Original material	21 days old, 8th generation	193 days	**2233**	540	420	Nov. 24th, 1906	Died 13 days	General tuberculosis.
P. XXXIX.	Original material	21 days old, 6th generation	196 days	**2237**	300	300	Nov. 27th, 1906	Died 15 days	General tuberculosis.
P. XL.	Original material	21 days old, 8th generation	196 days	**2241**	350	280	Nov. 27th, 1906	Died 16 days	General tuberculosis.
P. XLII.	Original material	21 days old, 8th generation	177 days	**2208**	520	350	Nov. 17th, 1906	Died 11 days	General tuberculosis.
P. XLIII.	Original material	21 days old, 6th generation	169 days	**2247**	370	240	Nov. 28th, 1906	Died 13 days	General tuberculosis.
P. XLVII.	Original material	21 days old, 8th generation	183 days	**2255**	450	400	Dec. 4th, 1906	Died 11 days	General tuberculosis.
P. XLIX.	Original material	21 days old, 6th generation	157 days	**2332**	300	220	Jan. 19th, 1906	Died 10 days	General tuberculosis.
P. L.	Original material	25 days old, 7th generation	141 days	**2280**	350	300	Jan. 3rd, 1906	Died 47 days	General tuberculosis. Inoculation partly subcutaneous.
P. LI.	Original material	16 days old, 5th generation	95 days	**2324**	370	350	Jan. 18th, 1906	Died 9 days	General tuberculosis.
P. LII.	Original material	20 days old, 5th generation	95 days	**2328**	570	420	Jan. 18th, 1906	Died 9 days	General tuberculosis.

Dose in each case: 0·1 milligramme.

P. I.	Original material	21 days old, 8th generation	138 days	**1630**	300	190	July 19th, 1905	Died 16 days	General tuberculosis.
P. V.	Original material	20 days old, 7th generation	134 days	**1655**	320	210	Aug. 30th, 1905	Died 14 days	General tuberculosis.
P. VI.	Guinea-pig 1515	20 days old, 6th generation	126 days	**1657**	560	380	Sept. 1st, 1905	Died 13 days	General tuberculosis.
P. VII.	Original material	20 days old, 8th generation	144 days	**1702**	560	370	Sept. 18th, 1905	Died 16 days	General tuberculosis.
P. VIII.	Original material	20 days old, 5th generation	117 days	**1673**	590	390	Sept. 5th, 1905	Died 12 days	General tuberculosis.

P. IX.	Original material	20 days old, 7th generation	125 days	**1706**	510	490	Sept. 20th, 1905	Died 14 days	General tuberculosis.
P. X.	Original material	21 days old, 5th generation	116 days	**1690**	580	420	Sept. 11th, 1905	Died 15 days	General tuberculosis.
P. XI.	Original material	20·5 days old, 4th generation	97 days	**1678**	620	420	Sept. 6th, 1905	Died 15 days	General tuberculosis.
P. XII.	Guinea-pig 1636	20 days old, 5th generation	101 days	**1802**	350	260	Dec. 14th, 1905	Died 18 days	General tuberculosis.
	Guinea-pig 1636	21 days old, 9th generation	298 days	**2121**	350	200	June 29th, 1906	Died 19 days	General tuberculosis.
P. XIII.	Original material	21 days old, 6th generation	116 days	**1763**	410	260	Oct. 30th, 1905	Died 14 days	General tuberculosis.
P. XIV.	Guinea-pig 1623	21 days old, 6th generation	139 days	**1808**	430	260	Jan. 29th, 1906	Died 17 days	General tuberculosis.
P. XV.	Original material	20 days old, 8th generation	114 days	**1784**	310	200	Nov. 23rd, 1905	Died 10 days	General tuberculosis.
P. XVI.	Original material	20 days old, 5th generation	100 days	**1782**	260	200	Nov. 22nd, 1905	Died 11 days	General tuberculosis.
P. XVII.	Original material	20 days old, 6th generation	123 days	**1807**	240	210	Dec. 15th, 1905	Died 19 days	General tuberculosis.
P. XVIII.	Original material	20 days old, 6th generation	119 days	**1794**	360	270	Dec. 11th, 1905	Died 18 days	General tuberculosis.
P. XIX.	Original material	20 days old, 6th generation	128 days	**1814**	340	250	Dec. 20th, 1905	Died 14 days	General tuberculosis.
P. XX.	Original material	21 days old. 5th generation	85 days	**1918**	660	390	Feb. 23rd, 1906	Died 13 days	General tuberculosis.
P. XXII.	Original material	21 days old. 4th generation	77 days	**1804**	220	170	Dec. 14th, 1905	Died 21 days	General tuberculosis.
P. XXIII.	Original material	21 days old, 6th generation	116 days	**1862**	340	280	Jan. 22nd, 1906	Died 59 days	General tuberculosis.
P. XXIV.	Guinea-pig 1790	20 days old, 3rd generation	102 days	**1943**	510	280	March 20th, 1906	Died 14 days	General tuberculosis.
P. XXV.	Original material	6 days old, 6th generation	76 days	**1916**	650	420	Feb. 22nd, 1906	Died 13 days	General tuberculosis.
P. XXVI.	Original material	22 days old, 6th generation	126 days	**1967**	540	390	April 13th, 1906	Died 15 days	General tuberculosis.
P. XXIX.	Original material	21 days old, 5th generation	114 days	**1965**	620	390	April 13th, 1906	Died 14 days	General tuberculosis.
P. XXX.	Original material	19 days old, 6th generation	132 days	**1982**	520	300	May 1st, 1906	Died 16 days	General tuberculosis.
P. XXXI.	Original material	20 days old, 6th generation	140 days	**2026**	570	370	May 9th, 1906	Died 13 days	General tuberculosis.
P. XXXII.	Original material	21 days old, 7th generation	143 days	**2134**	610	400	July 5th, 1906	Died 17 days	General tuberculosis.
P. XXXIII.	Original material	22 days old. 7th generation	140 days	**2136**	480	310	July 5th, 1906	Killed when dying, 20 days	General tuberculosis.
P. XXXIV.	Original material	22 days old, 7th generation	140 days	**2141**	430	480	July 6th, 1906	Died 50 days	General tuberculosis. Inoculation partly subcutaneous.
P. XXXVI.	Original material	21 days old, 10th generation	245 days	**2223**	420	320	Nov. 23rd, 1906	Died 17 days	General tuberculosis.
P. XXXVII.	Original material	21 days old, 10th generation	245 days	**2227**	370	230	Nov. 23rd, 1906	Died 18 days	General tuberculosis.

Intraperitoneal Inoculations of Guinea-pigs with Cultures of Virulent Tubercle Bacilli of Porcine Origin—*continued.*

Dose in each case : 0·1 milligramme—*continued.*

Virus.	Source of Culture.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Number of Guinea-pig.	Weight in Grammes.		Date of Inoculation.	Duration of Life.	Result.
					Initial.	Final.			
P. XXXVIII.	Original material	21 days old, 8th generation	193 days	2231	380	340	Nov. 24th, 1906	Died 15 days	General tuberculosis.
P. XXXIX.	Original material	21 days old, 6th generation	196 days	2235	450	450	Nov. 27th, 1906	Died 11 days	General tuberculosis.
P. XL.	Original material	21 days old, 8th generation	196 days	2239	400	350	Nov. 27th, 1906	Died 21 days	General tuberculosis.
P. XLII.	Original material	21 days old, 8th generation	177 days	2206	400	350	Nov. 17th, 1906	Died 26 days	General tuberculosis.
P. XLIII.	Original material	21 days old, 6th generation	169 days	2245	300	300	Nov. 28th, 1906	Died 27 days	General tuberculosis.
P. XLVII.	Original material	21 days old, 8th generation	183 days	2253	470	450	Dec. 4th, 1906	Died 13 days	General tuberculosis.
P. XLIX.	Original material	21 days old, 6th generation	157 days	2330	320	240	Jan. 19th, 1907	Died 10 days	General tuberculosis.
P. L.	Original material	25 days old, 7th generation	141 days	2278	550	400	Jan. 3rd, 1907	Died 61 days	General tuberculosis. Inoculation partly subcutaneous.
P. LI.	Original material	16 days old, 5th generation	95 days	2322	400	270	Jan. 18th, 1907	Died 13 days	General tuberculosis.
P. LII.	Original material	20 days old, 5th generation	95 days	2326	470	370	Jan. 18th, 1907	Died 13 days	General tuberculosis.
P. LIII.	Original material	21 days old, 8th generation	185 days	2570	780	500	July 15th, 1907	Died 17 days	General tuberculosis.
P. LIV.	Original material	21 days old, 7th generation	185 days	2572	920	600	July 15th, 1907	Died 21 days	General tuberculosis.
P. LV.	Original material	22 days old, 7th generation	186 days	2574	650	400	July 16th, 1907	Died 19 days	General tuberculosis.
P. LVI.	Original material	21 days old, 5th generation	143 days	2608	370	270	Sept. 9th, 1907	Died 20 days	General tuberculosis.
P. LVII.	Original material	21 days old, 5th generation	117 days	2612	370	200	Sept. 10th, 1907	Died 16 days	General tuberculosis.
P. LVIII.	Original material	21 days old, 6th generation	129 days	2678	450	240	Oct. 3rd, 1907	Died 18 days	General tuberculosis.
P. LIX.	Original material	21 days old, 6th generation	119 days	2668	540	300	Oct. 2nd, 1907	Died 20 days	General tuberculosis.
P. LX.	Original material	14 days old, 6th generation	118 days	2658	480	280	Oct. 1st, 1907	Died 17 days	General tuberculosis.
P. LXI.	Original material	21 days old, 5th generation	101 days	2715	600	400	Oct. 8th, 1907	Died 19 days	General tuberculosis.
P. LXII.	Original material	21 days old, 5th generation	107 days	2751	250	190	Oct. 14th, 1907	Died 16 days	General tuberculosis. Inoculation wholly subcutaneous.
P. LXIII.	Original material	24 days old, 4th generation	94 days	2795	550	350	Oct. 22nd, 1907	Died 50 days	General tuberculosis.

SUBCUTANEOUS INOCULATIONS OF GUINEA-PIGS WITH CULTURES OF VIRULENT TUBERCLE BACILLI OF PORCINE ORIGIN.

Dose in each Case 1·0 milligramme.

P. XII.	Guinea-pig 1636	21 days old, 9th generation	298 days	2122	440	220	June 29th, 1906	Died 52 days	General tuberculosis.
P. XXXVI.	Original material	21 days old, 10th generation	245 days	2224	450	320	Nov. 23rd, 1906	Died 44 days	General tuberculosis.
P. XXXVII.	Original material	21 days old, 10th generation	245 days	2228	400	289	Nov. 23rd, 1906	Died 46 days	General tuberculosis.
P. XXXVIII.	Original material	21 days old, 8th generation	193 days	2232	360	350	Nov. 24th, 1906	Died 38 days	General tuberculosis.
P. XXXIX.	Original material	21 days old, 6th generation	196 days	2236	320	350	Nov. 27th, 1906	Died 61 days	General tuberculosis.
P. XL.	Original material	21 days old, 8th generation	196 days	2240	500	400	Nov. 27th, 1906	Died 16 days	General tuberculosis. Inoculation intraperitoneal.
P. XLII.	Original material	21 days old, 8th generation	177 days	2207	500	300	Nov. 17th, 1906	Died 54 days	General tuberculosis.
P. XLIII.	Original material	21 days old, 6th generation	169 days	2246	370	340	Nov. 28th, 1906	Died 52 days	General tuberculosis.
P. XLVII.	Original material	21 days old, 8th generation	183 days	2254	500	350	Dec. 4th, 1906	Died 76 days	General tuberculosis.
P. XLIX.	Original material	21 days old, 6th generation	157 days	2331	240	200	Jan. 19th, 1907	Died 36 days	General tuberculosis.
P. L.	Original material	25 days old, 7th generation	141 days	2279	350	270	Jan. 3rd, 1907	Died 29 days	General tuberculosis.
P. LI.	Original material	16 days old, 5th generation	95 days	2323	470	400	Jan. 18th, 1907	Died 39 days	General tuberculosis.
P. LII.	Original material	20 days old, 5th generation	95 days	2327	550	380	Jan. 18th, 1907	Died 45 days	General tuberculosis.

Dose in each case: 0·1 milligramme.

P. I.	Original material	21 days old, 8th generation	138 days	1629	260	230	July 19th, 1905	Died 37 days	General tuberculosis.
P. V.	Original material	20 days old, 7th generation	134 days	1654	320	260	Aug. 30th, 1905	Died 49 days	General tuberculosis.
P. VI.	Guinea-pig 1515	20 days old, 6th generation	126 days	1656	370	250	Sept. 1st, 1905	Died 36 days	General tuberculosis.
P. VII.	Original material	20 days old, 8th generation	144 days	1701	630	500	Sept. 18th, 1905	Died 33 days	General tuberculosis.
P. VIII.	Original material	20 days old, 5th generation	117 days	1672	460	—	Sept. 5th, 1905	Died 5 days	Death from colitis.
P. IX.	Original material	20 days old, 7th generation	125 days	1705	610	430	Sept. 20th, 1905	Died 42 days	General tuberculosis.
P. X.	Original material	21 days old, 5th generation	116 days	1689	670	380	Sept. 11th, 1905	Died 43 days	General tuberculosis.

Subcutaneous Inoculations of Guinea-pigs with Cultures of Virulent Tubercle Bacilli of Porcine Origin—*continued.*

Dose in each case: 0·1 milligramme—*continued.*

Virus.	Source of Culture.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Number of Guinea-pig.	Weight in Grammes.		Date of Inoculation.	Duration of Life.	Result.
					Initial.	Final.			
P. XI.	Original material	20·5 days old, 4th generation	97 days	**1677**	630	460	Sept. 6th, 1905	Died 34 days	General tuberculosis.
P. XII.	Guinea-pig 1636	20 days old, 5th generation	101 days	**1801**	320	400	Dec. 14th, 1905	Died 83 days	General tuberculosis.
	Guinea-pig 1636	21 days old, 9th generation	298 days	**2120**	400	230	June 29th, 1906	Died 53 days	General tuberculosis.
P. XIII.	Original material	21 days old, 6th generation	116 days	**1762**	460	300	Oct. 30th, 1905	Died 37 days	General tuberculosis.
P. XIV.	Guinea-pig 1623	21 days old, 6th generation	139 days	**1867**	380	250	Jan. 29th, 1906	Died 41 days	General tuberculosis.
P. XV.	Original material	20 days old, 8th generation	114 days	**1783**	320	250	Nov. 23rd, 1905	Died 48 days	General tuberculosis.
P. XVI.	Original material	20 days old, 5th generation	100 days	**1781**	380	280	Nov. 22nd, 1905	Died 49 days	General tuberculosis.
P. XVII.	Original material	20 days old, 6th generation	123 days	**1806**	340	230	Dec. 15th, 1905	Died 53 days	General tuberculosis.
P. XVIII.	Original material	20 days old, 6th generation	119 days	**1793**	390	250	Dec. 11th, 1905	Died 56 days	General tuberculosis.
P. XIX.	Original material	20 days old, 6th generation	128 days	**1813**	250	200	Dec. 20th, 1905	Died 41 days	General tuberculosis.
P. XX.	Original material	21 days old, 5th generation	85 days	**1917**	590	330	Feb. 23rd, 1906	Died 40 days	General tuberculosis.
P. XXII.	Original material	21 days old, 4th generation	77 days	**1803**	400	380	Dec. 14th, 1905	Died 57 days	General tuberculosis.
P. XXIII.	Original material	21 days old, 6th generation	116 days	**1861**	320	300	Jan. 22nd, 1906	Died 59 days	General tuberculosis.
P. XXIV.	Guinea-pig 1790	20 days old, 3rd generation	102 days	**1942**	370	200	March 28th, 1906	Died 26 days	General tuberculosis.
P. XXV.	Original material	6 days old, 6th generation	76 days	**1915**	800	420	Feb. 22nd, 1906	Died 34 days	General tuberculosis.
P. XXVI.	Original material	22 days old, 6th generation	126 days	**1966**	670	470	April 13th, 1906	Died 37 days	General tuberculosis.
P. XXIX.	Original material	21 days old, 5th generation	114 days	**1964**	600	400	April 13th, 1906	Died 45 days	General tuberculosis.
P. XXX.	Original material	19 days old, 6th generation	132 days	**1981**	400	240	May 1st, 1906	Died 36 days	General tuberculosis.
P. XXXI.	Original material	20 days old, 6th generation	140 days	**2025**	520	270	May 9th, 1906	Died 35 days	General tuberculosis.
P. XXXII.	Original material	21 days old, 7th generation	143 days	**2133**	690	400	July 5th, 1906	Died 51 days	General tuberculosis.
P. XXXIII.	Original material	22 days old, 7th generation	140 days	**2135**	670	270	July 5th, 1906	Died 35 days	General tuberculosis.

P. XXXIV.	Original material	22 days old, 7th generation	140 days	2140	470	350	July 6th, 1906	Died 60 days	General tuberculosis.
P. XXXVI.	Original material	21 days old, 10th generation	245 days	2222	470	400	Nov. 23rd, 1906	Died 57 days	General tuberculosis.
P. XXXVII.	Original material	21 days old, 10th generation	245 days	2226	420	280	Nov. 23rd, 1906	Died 42 days	General tuberculosis.
P. XXXVIII.	Original material	21 days old, 8th generation	193 days	2230	450	300	Nov. 24th, 1906	Died 14 days	Early general tuberculosis. Inoculation intraperitoneal.
P. XXXIX.	Original material	21 days old, 6th generation	196 days	2234	350	330	Nov. 27th, 1906	Died 42 days	General tuberculosis.
P. XL.	Original material	21 days old, 8th generation	196 days	2238	400	320	Nov. 27th, 1906	Died 15 days	Early general tuberculosis. Inoculation intraperitoneal.
		20 days old, 10th generation	328 days	2417	550	400	April 8th, 1907	Died 31 days	General tuberculosis.
P. XLII.	Original material	21 days old, 8th generation	177 days	2205	320	300	Nov. 17th, 1906	Died 62 days	General tuberculosis.
P. XLIII.	Original material	21 days old, 6th generation	169 days	2244	300	370	Nov. 28th, 1906	Died 55 days	General tuberculosis.
P. XLVII.	Original material	21 days old, 8th generation	183 days	2252	520	550	Dec. 4th, 1906	Died 75 days	General tuberculosis.
P. XLIX.	Original material	21 days old, 6th generation	157 days	2329	300	230	Jan. 19th, 1907	Died 29 days	General tuberculosis.
P. L.	Original material	25 days old, 7th generation	141 days	2277	430	270	Jan. 3rd, 1907	Died 47 days	General tuberculosis.
P. LI.	Original material	16 days old, 5th generation	95 days	2321	520	390	Jan. 18th, 1907	Died 46 days	General tuberculosis.
P. LII.	Original material	20 days old, 5th generation	95 days	2325	320	270	Jan. 18th, 1907	Died 39 days	General tuberculosis.
P. LIII.	Original material	21 days old, 8th generation	185 days	2569	950	520	July 15th, 1907	Died 47 days	General tuberculosis.
P. LIV.	Original material	21 days old, 7th generation	185 days	2571	750	700	July 15th, 1907	Died 54 days	General tuberculosis.
P. LV.	Original material	22 days old, 7th generation	186 days	2573	850	460	July 16th, 1907	Died 36 days	General tuberculosis.
P. LVI.	Original material	21 days old, 5th generation	143 days	2607	370	250	Sept. 9th, 1907	Died 44 days	General tuberculosis.
P. LVII.	Original material	21 days old, 5th generation	117 days	2611	330	240	Sept. 10th, 1907	Died 52 days	General tuberculosis.
P. LVIII.	Original material	21 days old, 6th generation	129 days	2677	350	270	Oct. 3rd, 1907	Died 41 days	General tuberculosis.
P. LIX.	Original material	21 days old, 6th generation	119 days	2667	470	330	Oct. 2nd, 1907	Died 44 days	General tuberculosis.
P. LX.	Original material	14 days old, 6th generation	118 days	2657	470	290	Oct. 1st, 1907	Died 38 days	General tuberculosis.
P. LXI.	Original material	21 days old, 5th generation	101 days	2714	350	240	Oct. 10th, 1907	Died 36 days	General tuberculosis
P. LXII.	Original material	21 days old, 5th generation	107 days	2750	230	200	Oct. 14th, 1907	Died 39 days	General tuberculosis.
P. LXIII.	Original material	24 days old, 4th generation	94 days	2796	650	390	Oct. 22nd, 1907	Died 42 days	General tuberculosis.

INTRAPERITONEAL INOCULATIONS OF GUINEA-PIGS WITH CULTURES OF SLIGHTLY VIRULENT TUBERCLE BACILLI OF PORCINE ORIGIN.

Virus.	Source of Culture.	Dose.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Number of Guinea-pig.	Weight in Grammes.		Date of Inoculation.	Duration of Life.	Result.
						Initial.	Final.			
P. IV.	Original material	0·1 mg.	20 days old, 5th generation	76 days	1569	410	280	June 5th, 1905	Died 21 days	General tuberculosis.
P. IV.	Original material	0·1 mg.	21 days old, 11th generation	183 days	1704	370	280	Sept. 20th, 1905	Died 18 days	General tuberculosis.
P. XLI.	Original material	0·1 mg.	21 days old, 8th generation	175 days	2194	450	380	Nov. 15th, 1906	Died 117 days	Chronic tuberculosis.—A very small amount of the dose had been inoculated into the peritoneal cavity, the needle having probably perforated the intestine.
P. XLI.	Original material	1·0 mg.	21 days old, 8th generation	175 days	2196	450	300	Nov. 15th, 1906	Died 18 days	General tuberculosis.
P. XLI.	Original material	1·0 mg.	21 days old, 10th generation	245 days	2341	270	200	Jan. 24th, 1907	Died 23 days	General tuberculosis.
P. XLI.	Original material	1·0 mg.	21 days old, 10th generation	245 days	2343	270	250	Jan. 24th, 1907	Died 17 days	General tuberculosis.
P. XLI.	Original material	1·0 mg.	21 days old, 10th generation	245 days	2344	300	240	Jan. 24th, 1907	Died 12 days	General tuberculosis.
P. XLVI.	Original material	0·1 mg.	21 days old, 7th generation	136 days	2190	600	400	Nov. 15th, 1906	Died 16 days	General tuberculosis.—The duration of life was shortened owing to strangulation of the intestine by a contracted omentum.
P. XLVI.	Original material	1·0 mg.	21 days old, 7th generation	136 days	2192	680	420	Nov. 15th, 1906	Died 19 days	General tuberculosis.

SUBCUTANEOUS INOCULATIONS OF GUINEA-PIGS WITH CULTURES OF SLIGHTLY VIRULENT TUBERCLE BACILLI OF PORCINE ORIGIN.

P. IV.	Original material	0·1 mg.	20 days old, 5th generation	76 days	1568	480	270	June 5th, 1905	Died 36 days	General tuberculosis.
P. IV.	Original material	0·1 mg.	21 days old, 11th generation	183 days	1703	740	450	Sept. 20th, 1905	Died 41 days	General tuberculosis.
P. XLI.	Original material	0·1 mg.	21 days old, 8th generation	175 days	2193	400	270	Nov. 15th. 1906	Died 45 days	General tuberculosis.
P. XLI.	Original material	1·0 mg.	21 days old, 8th generation	175 days	2195	400	310	Nov. 15th, 1906	Died 58 days	General tuberculosis.
P. XLVI.	Original material	0·1 mg.	21 days old, 7th generation	136 days	2189	620	460	Nov. 15th, 1906	Died 47 days	General tuberculosis.
P. XLVI.	Original material	1·0 mg.	21 days old, 7th generation	136 days	2191	620	430	Nov. 15th, 1906	Died 81 days	General tuberculosis.

INOCULATIONS OF GUINEA-PIGS WITH ORIGINAL MATERIAL OF THE PORCINE VIRUSES.

Virus.	Material used.	Number of Guinea-pig.	Weight in Grammes.		Method of Inoculation.	Date of Inoculation.	Duration of Life.	Result.
			Initial.	Final.				
P. I.	Submaxillary gland	1455	450	630	Intraperitoneal	March 4th, 1905	Killed 37 days	General tuberculosis.
P. II.	Submaxillary gland	1461	280	330	Intraperitoneal	March 10th, 1905	Killed 31 days	Caseo-purulent nodules in the omentum. Purulent foci in pyloric, lumbar, and sternal glands.
P. III.	Submaxillary gland	1462	290	440	Intraperitoneal	March 10th, 1905	Killed 33 days	A few opaque foci in the omental, pyloric, and coeliac glands.
P. IV.	Submaxillary gland	1468	400	300	Intraperitoneal	March 22nd, 1905	Died 72 days	General tuberculosis.
P. V.	Submaxillary gland	1510	200	270	Intraperitoneal	April 18th, 1905	Killed 37 days	General tuberculosis.
	Bronchial gland	1511	320	200	Intraperitoneal		Died 31 days	General tuberculosis.
P. VI.	Udder	1515	530	430	Intraperitoneal	April 28th, 1905	Died 24 days	General tuberculosis.
P. VII.	Submaxillary gland	1514	510	460	Intraperitoneal	April 28th, 1905	Died 46 days	General tuberculosis.
P. VIII.	Submaxillary gland	1535	490	430	Intraperitoneal	May 12th, 1905	Died 10 days	Sub-acute infection.
P. IX.	Submaxillary gland	1549	340	190	Intraperitoneal	May 19th, 1905	Died 30 days	General tuberculosis.
P. X.	Mesenteric gland	1550	570	370	Intraperitoneal	May 19th, 1905	Died 35 days	General tuberculosis.
P. XI.	Submaxillary gland	1559	520	440	Intraperitoneal	June 2nd, 1905	Died 16 days	General tuberculosis.
P. XII.	Submaxillary gland	1608	340	—	Intraperitoneal	June 27th, 1905	Died 1 day	Acute infection.
P. XIII.	Bronchial gland	1618	—	—	Intraperitoneal	July 7th, 1905	Died 34 days	General tuberculosis.
P. XIV.	Submaxillary gland	1623	310	230	Subcutaneous	July 14th, 1905	Died 60 days	General tuberculosis.
		1624	270	350	Intraperitoneal		Killed 52 days	General tuberculosis.
P. XV.	Submaxillary gland	1639	330	290	Subcutaneous	August 1st, 1905	Died 59 days	General tuberculosis.
P. XVI.	Bronchial gland	1640	320	300	Intraperitoneal	August 15th, 1905	Died 39 days	General tuberculosis.
P. XVII.	Mesenteric gland	1641	500	350	Intraperitoneal	August 15th, 1905	Died 39 days	General tuberculosis.
P. XVIII.	Lung	1642	340	230	Intraperitoneal	August 15th, 1905	Died 36 days	General tuberculosis.

INOCULATIONS OF GUINEA-PIGS WITH ORIGINAL MATERIAL OF THE PORCINE VIRUSES—*continued.*

Virus.	Material used.	Number of Guinea-pig.	Weight in Grammes.		Method of Inoculation.	Date of Inoculation.	Duration of Life.	Result.
			Initial.	Final.				
P. XIX.	Submaxillary gland	1643	340	300	Intraperitoneal	August 15th, 1905	Died 42 days	General tuberculosis.
P. XXI.	Submaxillary gland	1789	310	190	Intraperitoneal	December 5th, 1905	Killed 41 days	A single tubercle in the omentum.
P. XXIV.	Submaxillary gland	1790	390	360	Intraperitoneal	December 8th, 1905	Killed 32 days	Early general tuberculosis.
P. XXV.	Submaxillary gland	1791	370	290	Intraperitoneal	December 8th, 1905	Died 26 days	General tuberculosis.
P. XXVI.	Submaxillary gland	1792	400	360	Intraperitoneal	December 8th, 1905	Died 41 days	General tuberculosis.
P. XXVII.	Submaxillary gland	1799	260	210	Subcutaneous	December 12th, 1907	Killed 30 days	Purulent local lesion and foci in the inguinal glands.
P. XXVIII.	Submaxillary gland	1815	450	—	Subcutaneous	December 21st, 1905	Killed 36 days	No tuberculosis.
P. XXIX.	Submaxillary gland	1816	330	300	Subcutaneous	December 21st, 1905	Died 89 days	General tuberculosis.
P. XXX.	Submaxillary gland	1817	300	210	Subcutaneous	December 21st, 1905	Died 35 days	General tuberculosis.
P. XXXI.	Submaxillary gland	1818	390	260	Subcutaneous	December 21st, 1905	Died 35 days	General tuberculosis.
P. XXXIII.	Submaxillary gland	1909	350	290	Subcutaneous	February 16th, 1906	Died 94 days	General tuberculosis.
P. XXXIV.	Submaxillary gland	1910	320	210	Subcutaneous	February 16th, 1906	Died 53 days	General tuberculosis.
P. XXXV.	Submaxillary gland	1931	750	—	Subcutaneous	March 9th, 1906	Died 16 days	No tuberculosis.
P. XXXVIII.	Submaxillary gland	2030	260	180	Intraperitoneal	May 16th, 1906	Died 37 days	General tuberculosis.
P. XXXIX.	Submaxillary gland	2031	290	—	Intraperitoneal	May 16th, 1906	Died 7 days	Subacute infection.
P. XL.	Submaxillary gland	2032	290	230	Intraperitoneal	May 16th, 1906	Died 27 days	General tuberculosis.
P. XLI.	Submaxillary gland	2047	470	320	Intraperitoneal	May 25th, 1906	Killed 31 days	General tuberculosis.
P. XLIII.	Submaxillary gland	2076	620	520	Intraperitoneal	June 12th, 1906	Killed 57 days	General tuberculosis.
P. XLIV.	Submaxillary gland	2119	520	560	Intraperitoneal	June 29th, 1906	Killed 40 days	Animal healthy.
P. XLVIII.	Submaxillary gland	2124	540	—	Intraperitoneal	July 2nd, 1906	Died 8 days	Subacute infection.
P. LII.	Submaxillary gland	2166	500	450	Intraperitoneal	October 16th, 1906	Died 75 days	General tuberculosis.

P. LVI.	Lung II.	2432	250	200	Intraperitoneal	April 20th, 1907	Died 47 days	General tuberculosis.
	Mesenteric gland	2433	370	480	Intraperitoneal		Killed 54 days	No tuberculosis.
	Lung I.	2434	500	480	Intraperitoneal		Died 2 days	Acute infection.
P. LVII.	Lung	2491	600	730	Intraperitoneal	May 17th, 1907	Died 75 days	General tuberculosis.
	Submaxillary gland	2492	560	490	Intraperitoneal		Died 54 days	General tuberculosis.
	Bronchial gland	2493	880	550	Intraperitoneal		Died 74 days	General tuberculosis.
P. LVIII.	Spleen	2501	300	370	Intraperitoneal	May 28th, 1907	Killed 91 days	General tuberculosis.
	Liver	2502	400	700	Intraperitoneal		Killed 91 days	Early general tuberculosis

TABULAR SUMMARY OF INOCULATION EXPERIMENTS ON RATS WITH VIRULENT TUBERCLE BACILLI OF PORCINE ORIGIN.

Virus.	Source of Culture.	No. of Rat.	Age and Generation of Culture.	Dose.	Date of Inoculation.	Duration of Life.		Result.
						Intrap.	Subcut.	
P. V.	Original material (bronchial gland).	75	7th generation, 20 days old.	25·0 mg.	Aug 30, 1905.	—	33 days (died).	At the seat of inoculation about the middle of the thigh there was a soft caseous mass about ½ in. in diameter. The anterior lobes of the lungs were solid, and filled with yellowish pultaceous material; there were similar nodules in the posterior lobes (not tuberculous). Other organs and all glands appeared normal. Microscopical.—Local lesion, swarms of T.B.; inguinal and iliac gland, very numerous T.B.; spleen, T.B. scanty; liver and lung, no T.B.
,,	,,	76	,,	25·0 mg.	,,	23 days (died).	—	The omentum contained one small irregular greyish-white mass and two small groups of greyish-white tubercles; the former was adherent to the floor of the abdomen. The parietal peritoneum, serous surfaces of intestines, and mesentery were congested, but no tubercles were seen. The spleen was very large, and extended into the pelvis; it was dark red in colour, and showed a small yellow necrotic patch. The liver was pale. The kidneys were normal. Lungs: The left lung, with the exception of the posterior margin of the caudal lobe, and the right cephalic lobe were red and quite solid; the right middle and caudal lobes were crepitant, and congested in patches; no tubercles were seen; the bronchi contained thick yellow pus. The mediastinal glands were slightly enlarged and congested. Microscopical examination (smears).—T.B. numerous in the omentum, liver, spleen, a mediastinal gland, and the right caudal lobe of lung; one T.B. found in a smear from a kidney; no T.B. in the blood or in the pus from a bronchus. The bacilli in the smears were often arranged in large clumps, and in the lung and mediastinal gland many were found inside cells.

TABULAR SUMMARY OF INOCULATION EXPERIMENTS ON RATS WITH VIRULENT TUBERCLE BACILLI OF PORCINE ORIGIN—*continued.*

Virus.	Source of Culture.	No. of Rat.	Age and Generation of Culture.	Dose.	Date of Inoculation.	Duration of Life.		Result.
						Intrap.	Subcut.	
P. XIV.	Original material, through G.P. 1623.	95	6th generation, 21 days old.	10·0 mg.	Jan. 29, 1906.	—	211 days (killed).	In the adductor muscles of the left thigh at the seat of inoculation were two nodules containing whitish soft caseous substance, one the size of a millet seed, the other of a wheat grain. All organs and glands appeared normal. Microscopical.—Very numerous T.B. were seen in a smear from the local lesion, and a moderate number in a smear from the lung; no T.B. were seen in liver, kidney, or spleen.
,,	,,	96	,,	10·0 mg.	,,	26 days (died).	—	The omentum and peritoneum appeared normal. The spleen was a little enlarged and firm. The lungs contained two or three patches of congestion in which numerous T.B. were found. The sternal glands were a little enlarged and firm. Other organs and glands appeared normal. Microscopical.—Kidney, liver, sternal and lumbar glands showed numerous T.B.; spleen and lungs, more numerous T.B.
P. XV.	Original material.	88	8th generation, 20 days old.	40·0 mg.	Nov. 23, 1905.	2 days (died).	—	Omentum, (?) slightly thickened; organs and glands, normal to the naked eye. Microscopical examination (smears).—T.B. numerous in liver and spleen; a few T.B. in the lung and a mediastinal gland; about 30 T.B. were found in the blood, and 20 in the marrow. A culture of the tubercle bacillus was obtained from the blood and inoculated intraperitoneally into Rat 94; the culture used was the 2nd generation, and its total age 39 days.
,,	Blood of Rat 88.	94	2nd generation, 19 days old.	5·0 mg.	Jan. 3, 1906.	62 days (died).	—	Omentum and peritoneum, normal. Spleen, enlarged; substance, a little firm. Lungs felt a little firm, but floated in water; they showed a whitish network on the surface, and the substance was a little congested. Other organs and glands appeared normal. Microscopical.—T.B. were numerous in smears from the liver, spleen, kidney, and marrow; very numerous in a smear from the lung. None were seen in a smear from a muscle; a few were seen in the blood.
,,	Blood of Rat 94.	97	2nd generation, 18 days old.	The growth from one serum tube.	April 9, 1906.	44 days (killed).	—	On the ligament of the liver was a small nodule containing soft pus. The omentum was not affected. The spleen was considerably enlarged. Microscopical.—Peritoneal nodule, swarming with T.B.; liver, T.B. in clumps; kidney, T.B. fairly numerous; lung and spleen, T.B. very numerous.
,,	Rat 97.	93	2nd generation, 9 days old.	The growth from one serum tube.	June 22, 1906.	57 days (died).	—	No omental or peritoneal disease; spleen, dark red, firm, and a little enlarged; lungs, expanded, mottled with congestion—no tubercles; liver and kidneys, normal. Microscopical.—T.B. very numerous in spleen; numerous in lungs; none found in liver and kidneys.
P. XIX.	Original material (submaxillary gland).	91	6th generation, 20 days old.	25·0 mg.	Dec. 20, 1905.	—	253 days (killed).	At the seat of inoculation, in the left thigh, beneath the skin, was a caseous nodule the size of a wheat grain. All organs and glands appeared normal. Microscopical.—Local lesion, T.B. very numerous; lung and spleen, T.B. fairly numerous; liver, no T.B. seen.

TABULAR SUMMARY OF INOCULATION EXPERIMENTS ON RATS WITH SLIGHTLY VIRULENT TUBERCLE BACILLI OF PORCINE ORIGIN.

P. IV.	Original material.	74	5th generation. 20 days old.	20·0 mg.	June 5, 1905	5 days (died).	—	In the subcutaneous tissues of the abdominal wall there was a focus of yellowish white pus. The omentum was drawn up, thickened, yellowish and nodular on the surface; on section it was composed of translucent grey tissue surrounding large foci of softening. There were two or three caseous tubercles in the small omentum. Parietal peritoneum normal. Intestines deeply congested. Mesenteric glands perhaps slightly enlarged. Other organs and glands normal. Microscopical Examination.—Very numerous T.B. in omentum; numerous T.B. in liver, spleen, lung, and a ventral mediastinal gland.
,,	,,	82	11th generation. 21 days old.	20·0 mg.	Sept. 20, 1905	—	204 days (killed).	The skin of the abdomen showed a small ridge at the base of one side, of which there was a little dried secretion (site of old ulcer). All the lymphatic glands and organs appeared normal. Microscopical Examination.—Few T.B. in smears from inguinal gland and lung; one seen in spleen smear.
,,	,,	83	,,	20·0 mg.	,,	18 days (died).	—	In the subcutaneous tissues near the left groin there was a nodule the size of a wheat grain filled with yellow pus. The omentum was adherent to a coil of the small intestine by a fibrous adhesion containing yellow purulent foci; in the gastro-splenic omentum there was a nodule the size of a small bean with fibrous walls and yellow purulent contents. On the mesentery were two millet seed sized tubercles with soft yellow centres; parietal peritoneum normal. On the surface of the liver in an angle between two lobes there was a pea-sized nodule with fibrous walls and soft yellow contents; the nodule was adherent to the diaphragm. Liver substance normal. Spleen (?) enlarged, normal on section. Kidneys normal. The lungs with the exception of a small congested patch appeared normal. The ventral mediastinal glands showed a narrow line of caseation around the periphery; the xiphisternal glands, the size of millet seeds, were caseous throughout. Other lymphatic glands appeared normal. Microscopical Examination.—Smears from the spleen pulp and the nodule on the surface of the liver showed very numerous T.B., and there were numerous T.B. in the liver and lung.

CHARTS AND POST-MORTEM NOTES.

In the following pages are given the Charts of Viruses P. IV, V, VI, VIII, IX, XI, XII, XIV, XXIX, XLI, and XLVI, and the full post-mortem notes of the larger animals inoculated with these viruses.

The remaining Viruses, P. I, II, III, VII, X, XIII, XV to XXVII inclusive, XXX to XXXIV inclusive, XXXVI to XL inclusive, XLII to XLIV inclusive, XLVII and XLIX to LXIII inclusive, were inoculated into rabbits and guinea-pigs only. These experiments are not charted; the results will be found in the tabular summaries on pages 177 to 206.

VIRUS P. IV.

(March 21st, 1905.)

SUBMAXILLARY GLAND.

CULTURE INOCULATIONS.

I.—June 5th, 1905.

The strain was derived from the original material, and had been in cultivation a total period of 76 days.

The culture used was the 5th generation, 20 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
308	Intrav.	1·0 mg.	K. 87 days	T. of lungs and kidneys, severe in the former.
307	Intrav.	0·1 mg.	K. 86 ,,	Similar to 308, but less severe in lungs.
310	Intrap.	10·0 mg.	K. 87 ,,	T. of peritoneum, omentum, and kidneys, not severe, and of lungs moderately severe.
312	Intrap.	1·0 mg.	K. 91 ,,	Local lesion. Slight T. of ungs and omentum.
314	Intrap.	0·1 mg.	D. 333 ,,	G. T.
309	Subcut.	10·0 mg.	K. 88 ,,	Local lesion. Slight T. of lungs.
311	Subcut.	1·0 mg.	K. 88 ,,	,, ,, ,,
313	Subcut.	0·1 mg.	K. 88 ,,	,, ,, ,,

II.—July 19th, 1905.

The strain was derived from the original material, and had been in cultivation a total period of 120 days.

The culture used was the 7th generation, 20 days old.

CALF 312.

Subcutaneous.

Dose : 50 mg.

Killed when in fair health October 17, 1905.

90 days.

The local tumour was fibroid and caseous in the centre The prescapular gland was largely composed of caseated tissue. In the lungs were moderately numerous transparent tubercles, and portions of the caudal lobes were consolidated (*see* P.M.). The suprarenals contained fairly numerous small tubercles. Several lymph glands contained one or more small foci.

CALF 314.

Subcutaneous.

Dose : 34 mg.

Killed : Dec. 1, 1905.

135 days.

Thin-walled cyst at seat of inoculation containing caseo-pus. The left prescapular gland was largely caseo-calcareous. The mesenteric glands contained minute calcareous tubercles; a single tubercle was seen in a thoracic gland.

Culture.

December 4th, 1905.

The strain was derived from the lung, and had been in cultivation a total period of 4½ months.

The culture used was the 4th generation, 20 days old.

FOWL 12.

Fed.

Dose : 32 mg.

Killed : 78 days.

Healthy.

CALF 356.

Subcutaneous.

Dose : 50 mg.

Killed : March 19, 1906.

105 days.

Fibroid local tumour with central cavity (containing thick caseo-pus) communicating externally by a sinus. In the left prescapular gland were some small caseous and calcareous tubercles.

CALF 358.

Subcutaneous.

Dose : 50 mg.

Killed : March 7, 1906.

93 days.

Abscess at seat of inoculation. Left prescapular gland contained a caseo-necrotic and calcified nodule. One or two minute tubercles were seen in one mediastinal and one portal gland, and in lung (?).

PIG 132.

Subcutaneous.

Dose : 1 mg.

Killed : April 5, 1906.

122 days.

Small caseo-calcareous tumour, with fibrous margin. A left inguinal gland contained six caseous slightly gritty nodules. The portal and ventral mediastinal glands contained calcareous or calcareo-caseous tubercles. About ten minute glassy tubercles were seen in the lung. The liver contained three small tubercles, and two coeliac glands one or more gritty foci.

PIG 134.

Fed.

Dose : 1 mg.

Killed : April 11, 1906.

128 days.

Both submaxillary glands contained small caseous gritty nodules. There was a grey tubercle in the lung Mesenteric glands normal.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
555	Intrav.	1·0 mg.	D. 88 days	T. of lungs and kidneys, very slight in latter. Small grey tubercles seen in principal muscles.
556	Intrap.	1·0 mg.	K. 276 ,,	Severe T. of lungs and thoracic glands. Slight T. of peritoneum. Moderately severe T. of kidneys.
557	Subcut.	50·0 mg.	D. 149 ,,	Local ulcer. One tubercle in spleen. Slight T. of liver and kidneys and lungs (rather more severe than in abdominal organs).

Culture

May 14th, 1906.

The strain was derived from the portal gland, and had been in cultivation a total period of 68 days.

The culture used was the 4th generation; 25 days old.

DOG 128.

Subcutaneous.

Dose : 50 mg.

Killed : 93 days.

Local ulcer. Foci in liver. Slight T. of lungs and bronchial glands.

CAT 74.

Subcutaneous.

Dose : 50 mg.

Killed : 92 days.

Local lesion. Slight T. of kidneys; one tubercle in lung.

June 1st, 1906.

The strain was derived from the prescapular gland, and had been in cultivation a total period of 3 months.

The culture used was the 5th generation, 21 days old

CALF 426.

Intramuscular.

Dose : 200 mg.

Died : June 30, 1906.

29 days.

Caseo-necrotic local tumour. The adjacent glands were firm, and infiltrated with a yellow network of necrosis. Moderate numbers of minute grey tubercles were seen in the lungs. There were numerous similar tubercles in the liver.

VIRUS P. IV.—*continued.*

(March 21st, 1905.)

CULTURE INOCULATIONS—*continued.*

III.—SEPTEMBER 20TH, 1905.

The strain was derived from the original material, and had been in cultivation a total period of 183 days.

The culture used was the 11th generation, 21 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
461	Intrav.	1·0 mg.	K. 90 days	Moderately severe T. of lungs and kidneys.
463	Intrap.	10·0 mg.	D. 18 „	Early G. T.
462	Intrap.	1·0 mg.	K. 90 „	Slight T. of peritoneum, kidneys, and lungs.
464	Subcut.	10·0 mg.	K. 90 „	Local lesion. Slight T. of lungs. One tubercle in left kidney.

CALF 350.

Subcutaneous.

Dose . 50 mg.

Killed : Dec. 19, 1905.

90 days.

Small fibro-caseous local tumour. Left prescapular gland showed ¼ of the cortex caseo-calcareous. The thoracic glands contained few minute foci. One tubercle was seen in a coeliac gland, and one in the lung.

PIG 124.

Fed.

Dose : 1 mg.

Killed : Jan. 16, 1906.

118 days.

Each submaxillary gland contained small caseous and slightly calcareous nodules. One mesenteric gland showed two tubercles, similar in character. One or two tubercles were seen in the lung, and in the portal and one bronchial gland.

PIG 126.

Subcutaneous.

Dose : 1 mg.

Killed : Jan. 12, 1906.

114 days.

Small caseating tumour, with fibrous margins. One left inguinal gland contained a caseated mass, other inguinal glands contained small caseous and calcareous tubercles and nodules ; some were normal. There were a few tubercles in the portal and mesenteric glands.

In the lungs was a moderate number of caseous and slightly gritty tubercles, up to 1 mm.

CULTURE.

APRIL 9TH, 1907.

The strain was derived from the prescapular gland, and had been in cultivation a total period of 487 days.

The culture used was the 14th generation, 21 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1294	Subcut.	25·0 mg.	K. 230 days	Caseous local lesion. Very slight T. of lungs and one kidney.
1295	Intrap.	1·0 mg.	D. 81 „	Tuberculosis of peritoneum, omentum, and kidneys not severe, and of lungs severe. Pseudo - tuberculosis of spleen and caecum.

CALF 312. Virus P. IV.

Subcutaneous inoculation of culture obtained from the original material of Virus P. IV.

Dose—50 milligrammes.

Date—July 19, 1905.

Weight at Inoculation—36·74 kilogrammes. [Age about 4 weeks.]

Killed when in fairly good health—October 17, 1905. [90 days after inoculation.]

Clinical History.

A week after inoculation there was a flattened slightly raised tumour 6·5 cm. in greatest diameter and a slightly enlarged prescapular gland.

The tumour increased in size, and four weeks after inoculation was prominent, rounded, and perceptibly softened in the centre.

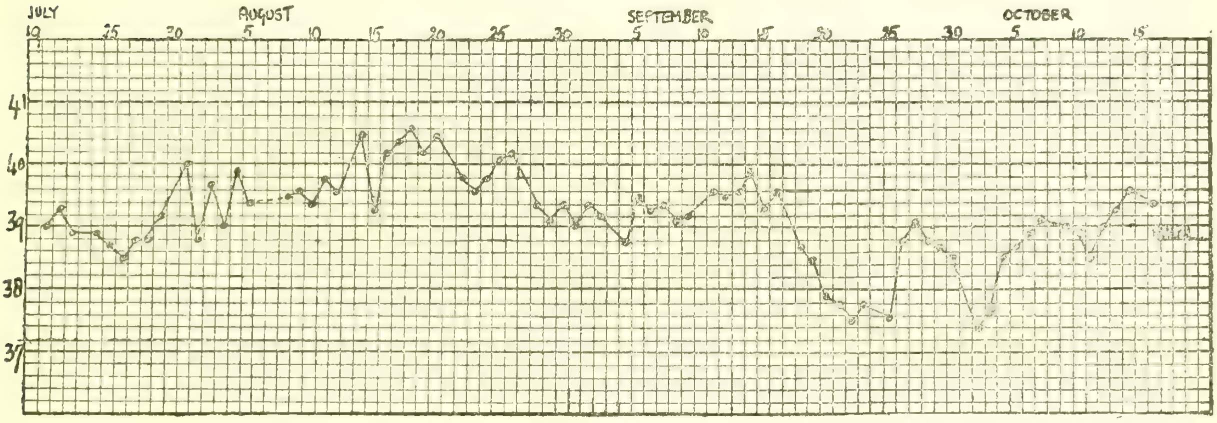
Seven weeks after inoculation the tumour measured 12·5 by 7 by 2·5 cm., and was soft and fluctuant in the upper part; the prescapular gland was hard and measured 7·5 cm. in greatest length.

Subsequently both tumour and gland diminished in size. There was no change in the general health until the fifth week when the respirations were seen to be distinctly quickened; they gradually increased in frequency, and for nearly three weeks were rapid and rather laboured, expiration ending in a short grunt; during this time there was frequent cough and the animal lost flesh. At one time the animal looked so ill that it appeared to be going to die.

The symptoms, however, abated, the respirations decreased in frequency and the general condition became much improved.

At the end of the experiment the respiration had not quite resumed its normal rate, but there was every indication that the animal was making a complete recovery.

Temperature.



Tuberculin Test.—The calf was not tested subsequent to inoculation.

Weights.

	Kilogrammes.
July 19, 1905	36·74
August 20, 1905	38·09
October 17, 1905	43·53

Total gain of weight.—6·80 kilogrammes.

The calf was weighed every week after inoculation; during the first six weeks the weight was practically stationary; subsequently there was a slight steady increase.

POST-MORTEM EXAMINATION.

Carcass.—In moderate condition.

Local Lesion.—The local tumour was small, thin, and lenticular in outline, measuring 9 by 6·5 by 2·5 cm.

On section it was composed of translucent fibrous tissue, showing in the centre irregular tracts of tough yellowish white caseated tissue; there were also, chiefly around the margins, irregular streaks and foci, slightly gritty from calcification.

In the middle of the upper part of the tumour there was a cavity the size of a walnut, filled with serous fluid containing small masses of broken down caseous tissue; the walls of the cavity were formed by caseated tissue, ragged and necrotic on the internal surface.

Left Prescapular Gland.—The left prescapular gland measured 6 by 3 by 2 cm. On section the greater part of the gland, about three quarters, was composed of firm homogeneous yellowish white caseated tissue, very slightly gritty from calcification. Around the margins of this mass, between it and the capsule, was a narrow zone of more or less normal gland tissue, containing here and there irregular opaque foci, most of which were gritty. The rest of the gland was normal, except for one firm encapsuled caseous nodule containing gritty foci.

Left Prepectoral Glands.—The rounded gland, the size of a pea, contained two minute opaque yellow foci; the reniform gland was normal.

Right Prepectoral Glands, Right Prescapular Gland (5 by 2 by 1 cm.), *Cervical Glands, and Axillary Glands.*—Normal.

Abdomen.

Peritoneum.—There was a slight excess of fluid in the peritoneal cavity.

Omentum.—Normal.

Spleen.—The spleen weighed 56·6 grammes. It was normal on the surface and on section.

Liver.—The liver was normal on the surface. On section two or three minute opaque yellow foci were seen (fatty?)

Portal Glands.—One portal gland showed two or three minute opaque yellow foci in the cortex; another contained one similar point.

Kidneys.—The right kidney showed on the surface two minute grey points of a doubtful nature.

The left was normal.

Suprarenals.—The left suprarenal body showed in the cortex fairly numerous tubercles, ranging in size from about 1 to 1·5 millimetre in diameter; the tubercles were grey, with slightly opaque centres.

The right suprarenal contained similar tubercles; in the centre of one was a minute calcareous grain.

Thorax.

Heart.—The endocardium of the right ventricle showed small patches of thickening, but no tubercles. Heart muscle and pericardium normal.

Pleura.—There was slight hypertrophy of the lymphatic fringes around the margin of the tendon on the right side, and small hard bodies could be felt at the base of some of them.

The pleura covering the ribs was normal.

Lungs.—The dorsal borders and posterior portions of the caudal lobes were firm, dark red and consolidated, and showed under the pleura a yellowish mottling. The yellow patches were situated in the centres of the small lobules, and showed around the margins fine arborisations, corresponding with the finer bronchioles. On section the solid lobules showed numerous small cavities (dilated bronchi) filled with tenacious muco-pus ; some of the lobules were composed throughout of firm reddish tissue, mottled with opaque yellow foci ; in the dorsal parts of the cephalic lobes there were a few consolidated lobules. The ventral parts of the caudal lobes, and almost the whole of the cephalic and right middle lobes were crêpitant ; on the surface of the former very numerous glistening transparent subpleural tubercles were seen ; they projected slightly above the surface, the majority being about one millimetre in diameter. On section through these portions similar tubercles were seen in the depth ; they were not, however, so distinct and apparently not so numerous as on the surface. In the cephalic lobes on the surface a few transparent tubercles were seen here and there and several doubtful transparent grey points ; on section tubercles were not definitely visible.

Left Bronchial Gland.—The left bronchial gland showed in the cortex a few minute whitish specks, some of which were just perceptibly gritty.

Right Bronchial Gland, Mediastinal Glands, Larynx, and Trachea.—Normal.

Alimentary Tract.

Pharynx, Tonsils, and Intestines.—Normal.

Mesenteric Glands.—Three mesenteric glands showed each a minute white speck.

All other lymphatic glands were normal.

Testes.—Normal.

Microscopical Examination.

Smears from :—

Lung (muco-pus, two smears).—Numerous tubercle bacilli.

Left Prescapular Gland.—Moderately numerous tubercle bacilli.

Right Prepectoral Gland, Mesenteric Gland, Left Suprarenal Body, Right Suprarenal Body, and Portal Gland.	A few tubercle bacilli.
Left Bronchial Gland, Liver, and Kidney.	No tubercle bacilli.

CALF 314. Virus P. IV.

Subcutaneous inoculation of culture obtained from the original material of Virus P. IV.

Dose—34 milligrammes.

Date—July 19, 1905.

Weight at Inoculation—33·55 kilogrammes. [Age about 5 weeks.]

Killed—December 1, 1905. [135 days after inoculation.]

[The calf was killed because it was suffering from paralysis of the hind legs (due to caries of the 12th dorsal vertebra). The general condition was good.]

Clinical History.

Seven days after inoculation there was an oval swelling measuring 5 by 4 cm., and a slightly enlarged prescapular gland. The swelling increased in size and on the 30th day measured 10 by 6 cm. and was distinctly softened ; the gland was moderately enlarged, measuring 8 by 5 cm.

Subsequently the tumour was converted into a thin-walled prominent pendulous cyst, 15 cm. in length by 10 cm. in breadth. The prescapular gland diminished in size and became irregular and nodular in outline. An enlarged prepectoral gland was felt during life. There was no obvious change in the general condition of the animal until November 29th, when it was found lying on its side and unable to rise from the ground, the hind legs being rigid and evidently paralysed. On the next day the calf was in much the same condition and, since it was unable properly to take nourishment, was killed.

Temperature.—On the 10th day after inoculation the temperature rose suddenly to 40·4° C., but fell to the normal two days later. During the remaining period of the experiment the temperature was a little raised, and at the same time irregular. The maximum range of variation within a period of 4 months was 1·6° C. (38·1° C.—39·7° C.).

Tuberculin Test.—November 17th, 1905. [121 days after inoculation.] Positive reaction Rise of temperature, 1·3° C.

Weights.

	Kilogrammes.
July 19, 1905	33·55
August 15, 1905	28·57
October 18, 1905	44·44
November 21, 1905	39·45
December 1, 1905	46·25

Total gain of weight during experiment.—12·69 kilogrammes.

POST-MORTEM EXAMINATION.

The carcass was in fair condition.

Local Lesion.—At the seat of inoculation there was a tense fluctuating tumour, measuring 15 by 10 by 9 cm. and weighing with skin 793 grammes. On section it was a thin-walled cyst, filled with thick creamy yellow caseo-pus ; the internal surface was pale and granular, and numerous calcareous grains were felt on passing the fingers over it ; the cavity was crossed by one thick fibrous band and several slender ones.

Left Prescapular Gland.—The left prescapular gland weighed a little over 28 grammes, and measured 6·5 by 4 by about 2·5 cm. in greatest thickness. It was irregular and nodular externally, and showed on section the greater part of the cortex replaced by calcareo-caseous masses, containing cavities filled with light brownish or creamy caseo-pus ; the medulla was normal.

Left Prepectoral Glands.—The spherical gland, 14 millimetres in diameter, showed about three quarters of the substance composed of dense calcareo-caseous tissue; the gland was very indurated and the capsule thickened. The reniform gland was normal.

Cervical Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—The right cephalic and right middle lobes showed some dark red patches of collapse; otherwise the lungs were perfectly normal to the naked eye.

Trachea.—Normal.

Thoracic Glands.—The caudal mediastinal gland contained one yellow pinhead-sized tubercle. Other mediastinal and the bronchial glands were normal.

Heart.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Large Intestine and Small Intestine.—Normal.

Mesenteric Glands.—The mesenteric glands were normal in size; they showed in the cortices minute yellow calcareous tubercles; these were most numerous in the terminal glands.

Spleen.—The spleen weighed 70·8 grammes, it was normal in size and general appearance.

Liver, Gall Bladder, and Portal Glands.—Normal.

Kidneys and Suprarenal Bodies.—Normal.

Bladder.—The bladder was greatly distended.

All the lymphatic glands not hitherto mentioned were normal.

Tongue, Tonsils, Pharynx, Larynx.—Normal.

Eyes.—Normal.

Vertebral Column.—On cutting into the spinal canal, the cord was found to be compressed at the level of the twelfth dorsal vertebra between a rounded projection of new formed bone, arising from the upper surface of the body of the vertebra, and by a recent blood clot between the laminae and the periosteum.

Section through the vertebra showed most of the cancellous tissue of the body hollowed out by rarefying osteitis, the floor of the cavity being formed by the anterior vertebral ligament, the roof chiefly by the mass of new formed bone, and the sides by the remains of the cancellous tissue. There was no sign of caseation or suppuration in the bone surrounding the cavity. The cord showed a well marked constriction, apparently recent; there was much gelatinous oedema in the posterior part of the canal between the periosteum and dura mater

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CALF 350. Virus P. IV.

Subcutaneous inoculation of culture derived from original material of Virus P. IV.

Dose—50 milligrammes.

Date—September 20, 1905.

Weight at Inoculation—33·10 kilogrammes. [Age about 4 weeks.]

Killed when in good health—December 19, 1905. [90 days after inoculation.]

Clinical Notes.

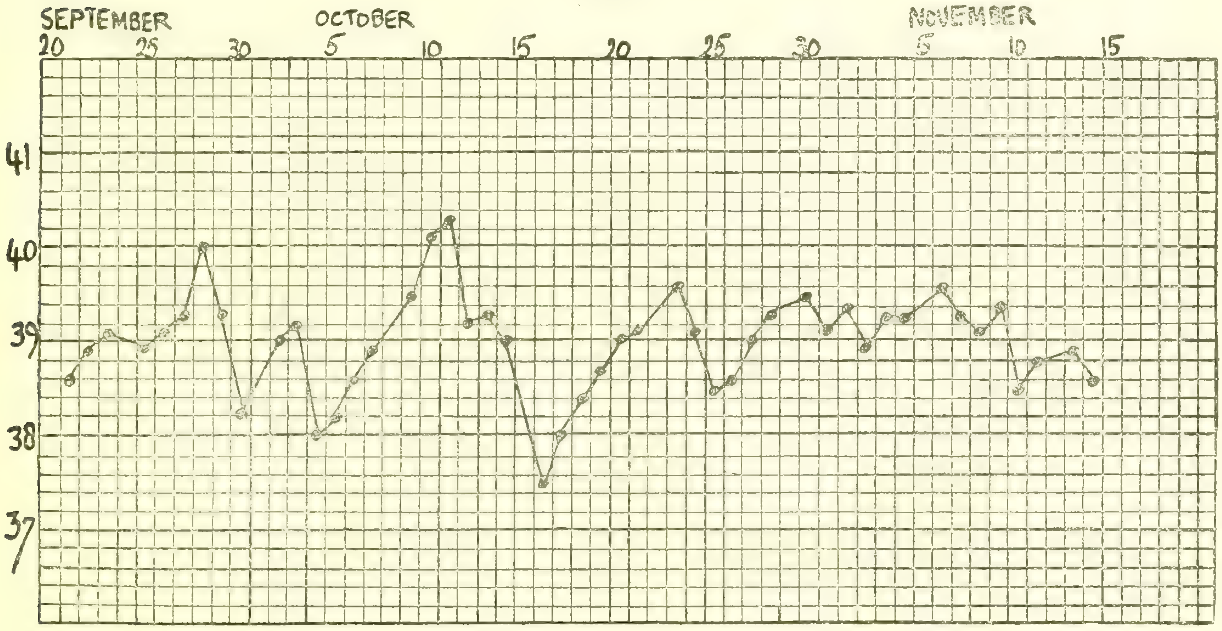
Ten days after inoculation on the left side of the neck a slight local thickening could be felt; the adjacent prescapular gland was slightly enlarged.

After three weeks a small slightly raised tumour had developed, which measured 6·5 by 5 cm.; the prescapular gland was still slightly enlarged, 5·5 cm. in length.

No further change of any importance took place in the local conditions.

The calf was killed on the 90th day. It had remained well during the experiment.

Temperature.



From November 15 to December 19 the temperature was fairly normal, though somewhat irregular. The maximum range of variation was between 38·0 and 39·3° C.

Tuberculin Test.—November 19, 1905 [58 days after inoculation]. Positive reaction. Rise of temperature 1·8° C.

Weights.

	Kilogrammes.
September 20, 1905	33·10
December 19, 1905	54·87

Total gain of weight.—21·76 kilogrammes.

Rate of gain per week.—1·67 kilogrammes.

POST-MORTEM EXAMINATION.

Carcass.—Carcass in moderate condition.

Local Lesion.—In the subcutaneous tissues on the right side of the neck there was a small tumour 6 by 4 by about 1·5 cm. in greatest thickness; on section it was composed of dense fibrous tissue containing two small cavities filled with buff coloured caseo-pus, and numerous small irregular gritty caseous nodules, most of which were softened; the skin and muscles were adherent but not infiltrated.

Right Prescapular Gland.—The right prescapular gland measured 5 by 3 cm. by about 2 cm. On section it showed rather more than a third of the cortex dense caseous and calcareous; the rest of the gland was normal.

Left Prescapular Gland.—The left prescapular gland measured 4·5 by 2·5 cm. by about 1·5 cm. and was normal on section.

Prepectoral Glands.—Right and left prepectoral glands normal.

Cervical Glands.—Right and left cervical glands normal.

Thorax.

Pleura.—Normal.

Lungs.—The lungs were normal in general appearance; in the left caudal lobe under the pleura there was a grey almost transparent miliary tubercle; under the pleura in all the lobes there was a number of very minute dark grey points of a doubtful nature; on section nothing abnormal was seen.

Trachea.—Normal.

Bronchial and Mediastinal Glands.—The bronchial and mediastinal glands were not enlarged. The caudal gland showed in the cortex a few minute yellow foci, some of which were appreciably gritty.

The gland above the bifurcation of the trachea, the bronchial and infratracheal glands, showed similar yellow foci, in small number.

The ventral mediastinal glands were normal.

Heart.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Small Intestine, Large Intestine, Gastric Glands, Mesenteric Glands, and Colic Glands.—Normal.

Spleen.—The spleen weighed 141 grammes; it was normal on the surface and on section.

Liver, Gall Bladder, Portal Glands, Kidneys, and Suprarenal Bodies.—Normal.

Coeliac Glands.—One coeliac gland contained a small irregular gritty tubercle; the others were normal.

Lumbar Glands and Iliac Glands.—Normal.

Testes.—Normal.

Special Glands.

Precrural, Pudic, Gluteal, Ischiatic, Popliteal, Submaxillary, Parotid, and Retropharyngeal.—Normal.

Tongue, Tonsils, and Larynx.—Normal.

Eyes.—Normal.

Microscopical Examinations. Smear preparations.

Prescapular Gland.—Numerous tubercle bacilli many long and beaded forms.

Coeliac Gland.—Two tubercle bacilli found.

Mediastinal Gland.—No tubercle bacilli.

PIG 124. Virus P. IV.

Fed with culture derived from original material of Virus P. IV.

Dose—1 milligramme.

Date—September 20, 1905.

Weight at Inoculation—10·0 kilogrammes. [Age 7 weeks.]

Killed when in good health—January 16, 1906. [118 days after feeding.]

Clinical Notes.—The pig remained in good health during the experiment.

Temperature.—Normal throughout.

Tuberculin Test.—The pig was not tested subsequent to inoculation.

Weights.

	Kilogrammes.
September 26, 1905	10·0
October 18, 1905	10·88
January 16, 1906	33·55

Total gain of weight.—23·55 kilogrammes.

POST-MORTEM EXAMINATION.

Carcass.—In good condition.

Alimentary Tract.

Tongue, Pharynx, Tonsils.—Normal.

Submaxillary Glands.—The submaxillary glands, one on each side, contained a moderate number of yellow cheesy caseous nodules, slightly gritty from calcification. They were irregular in outline, and shelled out easily from the surrounding gland tissue; in the gland on the left side they ranged in size from a pin's head to that of a wheat grain; in that on the right side they were a little larger, up to that of a pea.

Retro-pharyngeal Glands, Cervical Glands.—Normal.

Stomach, Small Intestine, Large Intestine, Gastric Glands.—Normal.

Mesenteric Glands.—A gland in the anterior part of the mesentery contained two irregular caseous gritty tubercles, the largest 1·5 millimetre in greatest diameter; other mesenteric glands were normal.

Ileo-Colic Glands, Colic Glands.—Normal.

Abdomen.

Omentum, Peritoneum, Spleen, Liver, Gall Bladder.—Normal.

Portal Glands.—One portal gland contained two pearly white spherical tubercles, each less than a pin's head in size.

Coeliac Glands, Kidneys, Suprarenal Bodies.—Normal.

Thorax.

Heart, Pleura.—Normal.

Lungs.—In the right cephalic lobe of the lung there was a subpleural grey tubercle, the size of a pin's head, with a yellow gritty centre. In the substance of the left caudal lobe there was a caseo-calcareous tubercle 1·5 millimetre in diameter. The rest of the lung was normal.

Bronchial Glands.—On the right side, in the angle between the right anterior bronchus and the trachea, a gland contained two yellow pinhead-sized caseous tubercles, slightly gritty from calcification. The other bronchial glands were normal.

Dorsal Mediastinal Glands, Ventral Mediastinal Glands.—Normal.

Various Lymphatic Glands.

Prescapular Glands, Prepectoral Glands, Precrural Glands, Iliac Glands, Lumbar Glands.—Normal.

Microscopical Examination.

Lung Tubercle.—No tubercle bacilli seen.

Tubercle from Bronchial Gland.—No tubercle bacilli seen.

Tubercle from Portal Gland.—No tubercle bacilli seen.

PIG 126. Virus P. IV.

Subcutaneous inoculation of culture derived from original material of Virus P. IV.

Dose—1 milligramme.

Date—September 20, 1905.

Weight at Inoculation—8·5 kilogrammes. [Age 7 weeks.]

Killed when in good health—January 12, 1906. [114 days after inoculation.]

Clinical Notes.

A very small swelling developed at the seat of inoculation in the abdominal wall, and the nearest inguinal gland became slightly enlarged.

Temperature.—The day after inoculation the temperature rose to 40·0° C. It quickly fell to normal. On the 13th day the temperature again rose, and reached a maximum of 39·8° C., returning to normal within a week. Subsequently the temperature remained normal.

Tuberculin Test.—The pig was not tested subsequent to inoculation.

Weights.

	Kilogrammes.
September 26, 1905	8·5
October 18, 1905	10·43
January 12, 1906	27·66

Total gain in weight during experiment.—19·16 kilogrammes.

POST-MORTEM EXAMINATION.

Carcass.—In good condition.

Local Lesion.—At the seat of inoculation near the umbilicus there was a nodule the size of a broad bean composed of tough yellowish white caseated tissue, gritty around the margins and softened in the centre, surrounded by a thin capsule of fibrous tissue; the skin was not adherent.

Inguinal Glands.—The glands on the right side were not enlarged; the one nearest the local lesion contained a pea-sized caseous slightly gritty nodule, with a mulberry like outline, and half-a-dozen caseous nodules, the largest the size of a hemp seed; the nodules shelled out easily from the gland substance; the other glands in this group were normal.

On the left side the gland nearest the local lesion was a little enlarged and showed about half its substance replaced by an irregular mass of firm caseated tissue slightly gritty from calcification; a pea-sized gland near it contained a small caseous nodule and another smaller gland a caseous tubercle; other glands in this group were normal.

Abdomen.

Iliac Glands, Ilio-Sacral Glands, Lumbar Glands, Omentum and Peritoneum.—Normal.

Spleen.—The spleen showed on the convex surface a patch of cicatricial thickening; otherwise normal.

Liver.—Normal.

Portal Glands.—One portal gland contained about nine yellowish tubercles, the largest the size of a pin's head; another contained three or four similar tubercles.

Kidneys, Suprarenal Bodies.—Normal.

Thorax.

Heart, Diaphragm, Pleura.—Normal.

Lungs.—The lungs were crepitant throughout and contained a moderate number of evenly distributed shotty tubercles ranging in size from about 0·5 to 1 millimetre in diameter; the tubercles were yellow caseous and slightly gritty and had narrow grey margins.

Dorsal Mediastinal, Bronchial Glands, Larynx, and Trachea.—Normal.

Alimentary Tract.

Tongue, Pharynx, Tonsils.—Normal.

Stomach, Intestines.—Normal.

Submaxillary, Retro-pharyngeal and Cervical Glands.—Normal.

Mesenteric Glands.—There were a few caseous gritty tubercles (largest 1 millimetre in diameter) in the glands in the anterior part of the mesentery and two in those in the posterior part.

Ileo-Colic Glands.—Normal.

Prescapular Glands, Prepectoral Glands, Coeliac Glands.—Normal.

Microscopical Examinations.

Portal Gland.—One tubercle bacillus seen.

Mesenteric Gland.—No tubercle bacilli.

Animal Inoculated.

A guinea-pig inoculated with an emulsion [from the spleen died in 18 days showing no evidence of tuberculosis.

CALF 356. Virus P. IV.

Subcutaneous inoculation of culture derived from the lung of Calf 312.

Dose—50 milligrammes.

Date—December 4, 1905.

Weight at Inoculation—56·69 kilogrammes. [Age about 12 weeks.]

Killed when in good health—March 19, 1906. [105 days after inoculation.]

Clinical Notes.

Eleven days after inoculation on the left side of the neck there was a slightly raised swelling measuring 10 by 7·5 cm. and about 2 cm. thick. The adjacent prescapular gland was about 7 cm. in length.

On the 32nd day there was a prominent fluctuating tumour at the seat of inoculation, measuring 14 by 7·5 cm. The prescapular gland was enlarged, 6 cm. in length.

On the 80th day the tumour was cystic, measuring 11 by 8 by about 5 cm.

On the 103rd day the tumour burst, discharging caseo-pus.

On the 105th day the calf was killed. It had shown no sign of ill-health during the experiment.

Temperature.—On the tenth day the temperature rose to 40·4° C. It remained high for ten days, and then returned to the normal. The temperature subsequently remained normal until the end of the experiment.

Tuberculin Test.—February 2nd, 1906, 60 days after inoculation. Positive reaction. Rise of temperature, 1·5° C.

Weights.

	Kilogrammes.
December 5, 1905	56·69
January 25, 1906	72·56
February 21, 1906	85·71
March 19, 1906	93·42

Total gain of weight during experiment. — 36·73 kilogrammes.

Average rate of gain per week.—2·44 kilogrammes.

POST-MORTEM EXAMINATION.

Carcass.—In very good condition.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a raised tumour measuring about 9 by 6·5 by 4 cm. At the upper extremity the skin showed a sinus, the diameter of a crow-quill, the outer opening of which was concealed by a mass of dried discharge. On section the tumour was composed of dense white fibrous tissue containing a few scattered yellow gritty tubercles ; just under the skin there was an irregular cavity 4·5 cm. in greatest diameter filled with thick yellow caseo-pus ; the cavity was lined with reddish granulation tissue and was crossed by several thick fibrous trabeculæ ; this cavity communicated externally by the sinus mentioned above ; the skin external to it was very thick except at one part where it appeared to be just on the point of breaking down.

Left Prescapular Gland. — The left prescapular gland measured 6·5 by 3 by nearly 1·5 cm., and was only slightly larger (thicker) than the right ; on section it showed in the cortex a number of yellow calcareous foci and a few soft whitish caseous tubercles, the largest a little more than 1 mm. in diameter ; there were besides two small nodules, the largest the size of a split pea, composed of brownish translucent tissue and calcareous particles ; the gland tissue was normal in appearance.

Right Prescapular Gland.—Normal.

Prepectoral and Cervical Glands on both sides were normal.

Thorax.

Heart.—Normal.

Pleura.—Normal.

Lungs.—Under the pleura a few minute scattered grey foci of a doubtful nature were seen (a smear made from one showed no tubercle bacilli) ; otherwise the lungs were perfectly normal.

Bronchial and Mediastinal Glands.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen (311 grammes).—Normal.

Liver.—Normal.

Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Tonsils, Pharynx, Larynx, and Trachea.—Normal.

Intestines.—Normal.

Testes.—Normal.

Eyes.—Normal.

Special Lymphatic Glands.

Parotid, Submaxillary, Pharyngeal, Axillary, Renal, Lumbar, Mesenteric, Gastric, Colic, Iliac, Precrural, Popliteal, Gluteal, Pudic, and Ischiatic Glands.—Normal.

Microscopical Examination.

(Smear Preparations.)

Prescapular Gland (soft tubercle).—A few tubercle bacilli seen.

Lung (grey focus).—No tubercle bacilli seen.

CALF 358. Virus P. IV.

Subcutaneous inoculation of culture derived from the lung of Calf 312.

Dose—50 milligrammes.

Date—December 4, 1905.

Weight at Inoculation—63·50 kilogrammes. [Age about 14 weeks.]

Killed when in good health—March 7, 1906. [93 days after inoculation.]

Clinical Notes.

Eleven days after inoculation on the left side of the neck there was a flat swelling measuring 9 by 7·5 cm. The adjacent prescapular gland was slightly enlarged, 6·5 cm. in length.

The swelling developed into a prominent softened tumour which on the 32nd day measured 9·5 by 7·5 cm.; the prescapular gland was enlarged, 7·5 cm. in length.

On the 80th day the tumour was tense, prominent and cystic, measuring 9 by 7·5 cm.; the prescapular gland had diminished in size and now measured about 5 cm. in length.

On the 93rd day after inoculation the calf was killed. It had remained well during the experiment.

Temperature.—There was a slight rise of temperature on the 11th day after inoculation which lasted 11 days and reached a maximum of 39·8° C. Subsequently the temperature remained normal.

Tuberculin Test.—February 2, 1906, 60 days after inoculation. Slight reaction. Rise of temperature 0·6° C.

Weights.

	Kilogrammes.
December 5, 1905	63·50
January 25, 1906	90·70
February 21, 1906	102·94
March 7, 1906	108·84

Total gain of weight during experiment.—45·34 kilogrammes.

Average rate of gain per week.—3·49 kilogrammes.

POST-MORTEM EXAMINATION.

General Condition.—Good.

Local Lesion.—At the seat of inoculation, on the left side of the neck, there was a tense egg-shaped fluctuant swelling measuring 9 by 6·5 by 5 cm.

On section it was found to be a thin-walled cyst filled with thick tenacious caseo-pus and yellow watery fluid; the walls of the cyst were formed by fibrous tissue lined internally with pale granulation tissue; the cavity was crossed by several fibrous trabeculae.

Left Prescapular Gland.—The left prescapular gland measured 5 by 2·5 by about 1·5 cm., and was only slightly thicker than the right. On section the cortex along the convex margin showed an irregular patch of dense tough caseo-necrotic tissue very gritty around the margins. The capsule of the gland external to the caseous mass was slightly thickened, and around the margins was a narrow zone of brownish translucent tissue; the latter and the peripheral parts of the caseated tissue were very gritty from calcification.

The right Prescapular, the right and left Prepectoral and Axillary Glands were normal.

Thorax.

Pleura.—Normal.

Lungs.—The lungs showed a few minute grey foci of a doubtful nature.

Thoracic Glands.—A dorsal mediastinal gland anterior to the bifurcation of the trachea contained a greyish white spherical tubercle about 1 mm. in diameter. Other thoracic glands were normal.

Heart.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Spleen.—Normal.

Liver.—Normal.

Portal Glands.—One portal gland seemed a little firmer than normal, and showed on section in the cortex slightly opaque greyish-white foci in some of which were yellow points; they were not perceptible to the touch.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Renal, Lumbar, and Iliac Glands.—Normal.

Alimentary Tract.

Tongue, Pharynx, Palate, Tonsils.—Normal.

Intestines.—Normal.

Mesenteric Glands.—Normal.

Various Lymphatic Glands.

Submaxillary, Pharyngeal, Parotideal, Hyoid.—Normal.

Precrural, Popliteal, Gluteal, Ischiatic, Pudic.—Normal.

Microscopic Examinations.

Emulsion of left Prescapular Gland.—Tubercle bacilli in moderate numbers.

Tubercles from Portal Gland.—(1) No tubercle bacilli seen. (2) One tubercle bacillus seen.

PIG 132. Virus P. IV.

Subcutaneous inoculation of culture derived from the lung of Calf 312.

Dose—1 milligramme.

Date—December 4, 1905.

Weight at Inoculation—26·0 kilogrammes. [Age about 15 weeks.]

Killed when in good health—April 5, 1906. [122 days after inoculation.]

Clinical Notes.

A small tumour developed at the seat of inoculation in the abdominal wall, and the adjacent inguinal gland became slightly enlarged.

The pig showed no sign of illness during the experiment.

Temperature.—Normal throughout.

Tuberculin Test.—February 2, 1906. [61 days after inoculation.] Positive reaction. Rise of temperature, 2·3° C.

Weights.

	Kilogrammes.
December 6, 1905	26·0
April 5, 1906	68·47

Total gain of weight during experiment.—42·47 kilogrammes.

Average rate of gain per week.—2·44 kilogrammes.

POST-MORTEM EXAMINATION.

Carcass.—In very good condition.

Local Lesion.—At the seat of inoculation a little to the left of the umbilicus there was a firm nodule, slightly adherent to the skin, 2·2 cm. in length and about 1·5 cm. in diameter; on section it was composed of somewhat tough yellow caseous material, slightly gritty from calcification and at one part beginning to soften, surrounded by a thin fibrous capsule.

Inguinal Glands.—On the left side the glands nearest the local lesion contained six caseous slightly gritty nodules ranging in size from 4 to 8 mm. in diameter; each nodule had a thin capsule of fibrous tissue; the caseous material in each case was friable but not softened and could be readily shelled out in a mass from its surrounding capsule; other glands in this group were normal.

On the right side the inguinal glands were normal.

Precrural Glands.—Normal.

Iliac and Lumbar Glands.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—Normal.

Liver.—The liver showed under the capsule two small tubercles (largest about 1 mm.) with grey margins and opaque yellow centres; in the depth of the liver substance one minute yellowish white spherical body was seen.

Portal Glands.—The portal glands were not enlarged, and contained discrete yellow calcareous tubercles, some very irregular in outline, the largest about 1 mm. in diameter; they very readily shelled out from the surrounding gland tissue which was perfectly normal in appearance.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Thorax.

Heart and Pleura.—Normal.

Lungs.—The lungs were normal in general appearance; they showed just under the pleura altogether about ten minute tubercles each about 0·5 mm. in diameter; the tubercles were glassy and very slightly opalescent in the centre.

Bronchial and Mediastinal Glands.—Each bronchial gland showed on section one minute white point; they were otherwise normal. The inter-bronchial, infra-tracheal, and dorsal mediastinal glands were normal.

Two ventral mediastinal glands were slightly enlarged; one contained a pea-sized gritty cheesy nodule; the other contained a similar but larger mass which almost completely replaced the gland substance; each mass was surrounded by a thin fibrous capsule.

Larynx and Trachea.—Normal.

Alimentary Tract.

Tongue, Tonsils, and Pharynx.—Normal.

Intestines.—Normal.

Gastric Glands.—Normal.

Mesenteric and Colic Glands.—Normal.

Uterus.—Normal.

Thyroid Body.—Normal.

Special Lymphatic Glands.

Coeliac Glands.—The largest gland contained a few minute yellowish white gritty foci; another smaller gland contained one similar focus; the rest were normal.

Submaxillary, Pharyngeal, Cervical, Prescapular, Prepectoral, and Precrural Glands.—Normal.

PIG 134. Virus P. IV.

Fed with culture derived from the lung of Calf 312.

Dose—1 milligramme.

Date—December 4, 1905.

Weight at Inoculation—20·25 kilogrammes. [Age about 15 weeks.]

Killed when in good health—April 11, 1906. [128 days after feeding.]

Clinical Notes.

The pig remained in good health during the experiment.

Temperature.—Normal.

Tuberculin Test.—February 2, 1906. [61 days after inoculation.] Positive reaction. Rise of temperature, 1·3° C.

Weights.

	Kilogrammes.
December 6, 1905	20·25
April 10, 1906	63·03

Total gain of weight during experiment.—42·78 kilogrammes.

Average rate of gain per week.—2·35 kilogrammes.

POST-MORTEM EXAMINATION.

Body in good condition.

Alimentary Tract.

Tongue, Tonsils and Pharynx.—Normal.

Submaxillary Glands.—The left submaxillary gland contained about half a dozen caseous gritty nodules, the largest nearly 3 mm. in diameter; each nodule was surrounded by a delicate capsule of fibrous tissue from which it could be readily shelled.

The right submaxillary gland contained two similar caseous nodules and a few discrete yellow gritty tubercles, irregular in outline.

Pharyngeal and Cervical Glands.—Normal.

Stomach.—Normal.

Small Intestine.—Normal.

Large Intestine.—Normal.

Gastric, Mesenteric, Ileo-Colic and Colic Glands.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—Normal.

Liver.—In the substance of the liver under the capsule on the anterior surface there was a whitish fibrous nodule, the size of a pea ; the liver substance around it showed an increase in interstitial connective tissue ; with this exception the liver was normal.

Portal Glands.—Normal.

Kidneys, Suprarenal Bodies.—Normal.

Thorax.

Heart and Pleura.—Normal.

Lungs.—The lungs were crepitant throughout and collapsed normally ; in the right caudal lobe under the pleura there was one grey almost transparent tubercle the size of a pin's head ; with this exception the lungs were normal.

Larynx and Trachea.—Normal.

Bronchial and Dorsal and Ventral Mediastinal Glands.—Normal.

Various Lymphatic Glands.

Prescapular, Prepectoral, Precrural, Inguinal, Iliac and Lumbar Glands.—Normal.

Special Organs.

Thyroid Body, Testes and Urinary Bladder.—Normal.

Microscopical Examination.

(Smear Preparation.)

Submaxillary Gland Nodule.—No tubercle bacilli.

Animal Inoculated.

A guinea-pig inoculated with an emulsion made from the nodule in the liver remained free from tuberculosis.

CALF 426. Virus P. IV.

Intramuscular inoculation of culture derived from prescapular gland of Calf 358 (injected with culture from Calf 312).

Dose—200 milligrammes.

Date—June 1, 1906.

Weight at Inoculation—29·02 kilogrammes. [Age about 8 weeks.]

Died—June 30, 1906. [29 days after inoculation.]

Clinical Notes.

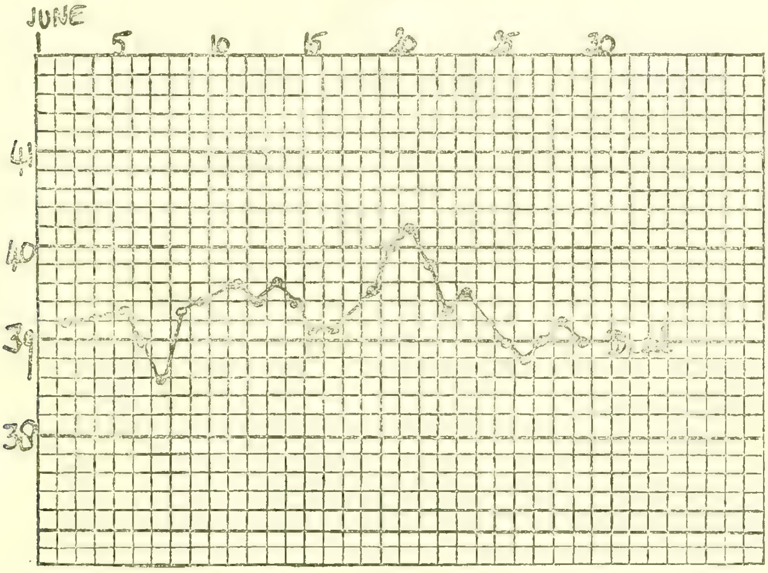
The calf was not in very good condition when inoculated ; it had suffered since its arrival at Walpole from severe diarrhœa.

Five days after inoculation on the left side of the neck a firm deep seated tumour had developed, measuring about 6·5 cm. in greatest diameter ; the skin was moveable over it. The adjacent prescapular gland was slightly enlarged.

On the 20th day the tumour was about 9 cm. in diameter ; the prescapular gland was slightly enlarged ; the prepectoral gland was the size of a pea.

On the 29th day the calf died. It had been in poor condition throughout the experiment ; its appetite was moderately good, but there was almost constant diarrhœa.

Temperature.



Tuberculin Test.—The calf was not tested subsequent to inoculation.

Weights.

	Kilogrammes.
June 1, 1906...	29·02
June 5, „	26·30
June 25, „	27·66

Total loss of weight during experiment.—1·36 kilogrammes.

POST-MORTEM EXAMINATION.

Carcass.—In very poor condition.

Local Lesion.—In the muscles on the left side of the neck there was an ill-defined swelling, measuring roughly 10 by 7·5 by 2·5 cm. ; the skin was freely moveable over it.

On section the muscles were found to contain a mass of yellow caseo-necrotic tissue, the margins of which were not definitely circumscribed : in the thicker part of the mass there was an egg-shaped cavity, 5 cm. in greatest diameter, filled with clear yellow serous fluid ; the internal wall was formed by soft shreddy necrotic material.

Left Prescapular Gland.—The left prescapular gland was enlarged and measured 6 by 3 cm. by about 2 cm.; on section the cortex was firmer than normal, and in places indurated, and showed a fine yellow network of necrosis, more definite in some parts of the cortex than in others.

Right Prescapular Gland.—The right prescapular gland measured 4 by 2 by 1 cm., and was normal on section.

Prepectoral Glands.—On the left side there were two enlarged glands, one the size of a broad bean, the other a little smaller ; both were indurated and showed on section a fine yellow network in the cortices. On the right side the glands were normal.

Cervical Glands.—Two lower cervical glands on the left side were enlarged and on section resembled the left prepectoral glands. On the right side the glands were normal.

A gland just within the entrance to the thorax was enlarged and a little firmer than normal and showed in the cortex a few very early foci of necrosis.

Thorax.

Lungs.—The lungs collapsed normally and showed, chiefly in the left lung, small irregular patches of collapse ; scattered evenly throughout the substance of the lungs were moderately numerous minute dark grey tubercles which projected slightly from the cut surface ; here and there was seen a larger tubercle with a slightly opaque centre.

The Bronchial and Mediastinal Glands appeared normal.

Heart and Pleura —Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—The spleen was normal in size and appeared normal on section.

Liver.—The liver was normal on the surface ; on section the substance showed numerous minute greyish white tubercles.

Portal Glands.—Normal.

Kidneys.—The capsules of the kidneys stripped badly ; the cortex was pale and diminished in thickness ; the kidney substance generally was tough and fibroid ; no tubercles were seen.

Suprarenal Bodies.—Normal.

Renal, Lumbar, and Iliac Glands.—Normal.

Alimentary Tract.

Pharynx, Tonsils.—Normal.

Intestines.—Normal.

Mesenteric, Gastric, and Colic Glands.—Normal.

Various Lymphatic Glands.

Pharyngeal, Parotid, Submaxillary, Axillary, Coeliac, Precrural, Popliteal, Pudic, Ischiatic, and Gluteal Glands.—Normal.

VIRUS P. V.

(April 18, 1905.)

BRONCHIAL GLAND.

CULTURE INOCULATIONS, AUGUST 30, 1905.

The strain was derived from the original material and had (been in cultivation) a total period of 134 days.

The culture used was the 7th generation, 20 days old.

CALF 336.

Subcutaneous.
Dose : 50 mg.
Died : Sept. 28, 1905.
29 days.
P.M.—General Tuberculosis, severe.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
397	Intrav.	0·1 mg.	D. 21 days	G. T.
394	Intrap.	1·0 mg.	D. 21 „	G. T.
399	Intrap.	1·0 mg.	D. 13 „	G. T.
398	Intrap.	0·1 mg.	D. 29 „	G. T.
400	Intrap.	0·01 mg.	D. 30 „	G. T.
395	Subcut.	1·0 mg.	D. 88 „	G. T.
396	Subcut.	0·1 mg.	D. 58 „	G. T.

CALF 336. Virus P. V.

Subcutaneous inoculation of culture derived from the original material of Virus P. V.

Dose—50 milligrammes.

Date—August 30, 1905.

Weight at Inoculation—29·48 kilogrammes. [Age about 6 weeks.]

Died—September 28, 1905. [29 days after inoculation.]

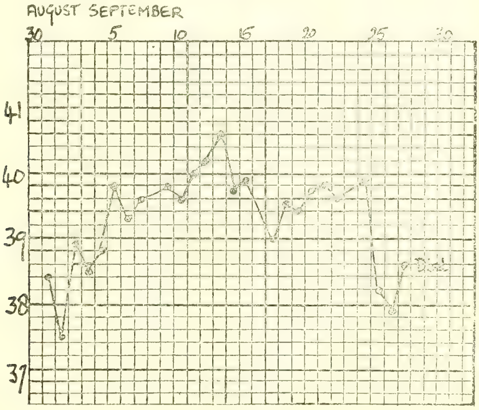
Clinical Notes.

Seven days after inoculation on the left side of the neck there was a flattened local thickening, infiltrating the muscles, measuring 7·5 by 6·5 cm. ; there was slight oedema in the loose tissues around the lower extremity. The prescapular gland was very slightly enlarged.

On the 23rd day a tumour had developed at the seat of inoculation, which measured 11·5 by 9 cm. and was not more than 2 cm. thick. The prescapular gland was enlarged, 7·5 cm. in length. The general condition of the calf was unchanged.

On the 29th day the calf died. It was not a very strong animal at the beginning of the experiment ; it was thin and did not thrive ; after the 23rd day it began to get thinner and weaker, and on the morning of the 29th day was found on the ground in a dying condition and unable to rise ; the respirations on the previous day were not obviously increased.

Temperature.



Tuberculin Test.—The calf was not tested subsequent to inoculation.

Weights.

	Kilogrammes.
August 30, 1905	29·48
September 28, 1905	23·12

Total loss of weight.—6·36 kilogrammes.

Average rate of loss per week.—1·58 kilogramme.

POST-MORTEM EXAMINATION.

Carcass.—Emaciated.

Seat of Inoculation.—In the subcutaneous tissues on the left side of the neck there was a flattened mass of dense yellow caseo-necrotic tissue, 10 by 5 by 1·5 c.m.; the mass was adherent to the skin and muscles, both of which were infiltrated to a slight extent.

Left Prescapular Gland.—The left prescapular gland measured 6·5 by 4 by 2·5 c.m. On section the greater part of the substance was composed of dense yellow caseated tissue; whilst the rest, chiefly around the hilum, was closely beset with small caseous tubercles.

Prepectoral Glands, Right Prescapular Gland.—The prepectoral glands on both sides and the right prescapular gland showed discrete irregular caseous tubercles in the cortices.

Cervical Glands.—On the left side a small gland near the inferior extremity of the tumour was caseous throughout; two others in the middle of the neck showed part of their cortex caseating. The superior cervical gland, near the mastoid, showed a reddish grey caseating patch and numerous discrete caseous tubercles.

The glands on the right side showed small caseous tubercles or caseous foci.

Abdomen.

Omentum.—On the inferior surface of the omentum were numerous grey tubercles, many loosely attached and deeply hæmorrhagic.

Peritoneum.—Normal.

Spleen.—The spleen was slightly enlarged, and weighed 226·5 grammes. On section the pulp was packed with opaque miliary tubercles, which gave the cut surface a coarsely granular appearance.

Liver.—The liver was mottled on the surface with purplish patches. The substance contained moderately numerous tubercles, ranging in size from a mere point up to about 1 millimetre in diameter; the larger ones were opaque in the centre.

Gall Bladder.—The gall bladder showed three opaque yellow foci under the mucous membrane.

Portal Glands.—The portal glands were slightly enlarged, and showed the cortex firm, grey, and in a state of early caseation; the glands were soft and oedematous in the centre.

Kidneys.—The kidneys contained sparsely scattered tubercles, the largest a little over a millimetre in diameter; they were slightly opaque in the centre.

Suprarenals.—The right suprarenal body contained an opaque tubercle the size of a pin's head.

Thorax.

Heart, Parietal Pleura.—Normal.

Diaphragm.—On the pleural surface of the diaphragm there was one pinhead-sized caseous tubercle.

Lungs.—The lungs showed only a moderate number of small tubercles, the largest about a millimetre in diameter. The tubercles had congested grey margins and opaque caseous centres. There were no large areas of consolidation, but in the left lobes a few lobules were dark and collapsed (not recent). In the latter lobes many of the tubercles or small groups of tubercles were surrounded by little angular patches of red hepatisation.

Bronchial and Mediastinal Glands.—The bronchial and mediastinal glands were moderately enlarged; they showed in the cortices grey or reddish grey translucent tissue, containing a fine yellow caseous network.

The ventral mediastinal glands were closely beset with yellow caseous tubercles, irregular in outline.

Larynx, Trachea.—Normal.

Alimentary Tract.

Tonsils.—The tonsils contained each a few caseous tubercles.

Tongue, Pharynx.—Normal.

Small Intestine.—All the Peyer's patches contained minute yellow caseous tubercles; they were very numerous in the long Peyer's patch, and not so numerous in the others. In the mucous membrane a few sparsely scattered tubercles were seen; in the middle part the mucous membrane showed three or four haemorrhagic erosions.

Large Intestine.—Normal.

Mesenteric Glands.—The mesenteric glands were slightly enlarged; the cortex of each was composed throughout of grey translucent tissue containing a fine caseous network. In the medullary parts of the glands were discrete pinhead-sized caseous tubercles.

Ileo-Colic Glands.—The ileo-colic glands were similarly, but rather less severely, affected.

Colic Glands, Gastric Glands.—These glands contained numerous caseous foci.

Various Lymphatic Glands.

Precrural, Popliteal, Pubic, Gluteal, Axillary.—All contained numerous small irregular caseous tubercles.

Ischiatic.—These glands showed a few minute caseous foci.

Submaxillary, Retropharyngeal.—These glands were very closely beset with minute caseous tubercles.

Coeliac.—The coeliac glands were slightly enlarged, and showed early caseous foci in the cortex.

A few haemolymph glands contained small caseous tubercles.

Testes, Eyes.—Normal.

Microscopical Examination.

Tubercle from Suprarenal Body.—No tubercle bacilli seen.

VIRUS P. VI.

(April 28, 1905.)

INGUINAL GLAND.

Culture Inoculations, September 1, 1905.

The strain was derived from the original material through G.P. 1515, and had been in cultivation a total period of 126 days.

The culture used was the 6th generation, 20 days old.

CALF 326.

Subcutaneous.
Dose : 50 mg.
Killed when very ill :
Sept. 30, 1905. 29 days.
P.M.—General Tuberculosis, severe.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
403	Intrav.	0·1 mg.	D. 20 days	G. T.
401	Intrap.	1·0 mg.	D. 15 „	G. T.
404	Intrap.	1·0 mg.	D. 20 „	G. T.
405	Intrap.	0·1 mg.	D. 33 „	G. T.
407	Intrap.	0·01 mg.	D. 36 „	G. T.
402	Subcut.	1·0 mg.	D. 71 „	G. T.
406	Subcut.	0·1 mg.	D. 88 „	G. T.

CALF 326. Virus P. VI.

Subcutaneous inoculation of culture derived from the original material of Virus P. VI through G.P. 1515.

Dose—50 milligrammes.

Date—September 1, 1905.

Weight at Inoculation—41·27 kilogrammes. [Age about 6½ weeks.]

Killed when very ill—September 30, 1905. [29 days after inoculation.]

Clinical Notes.

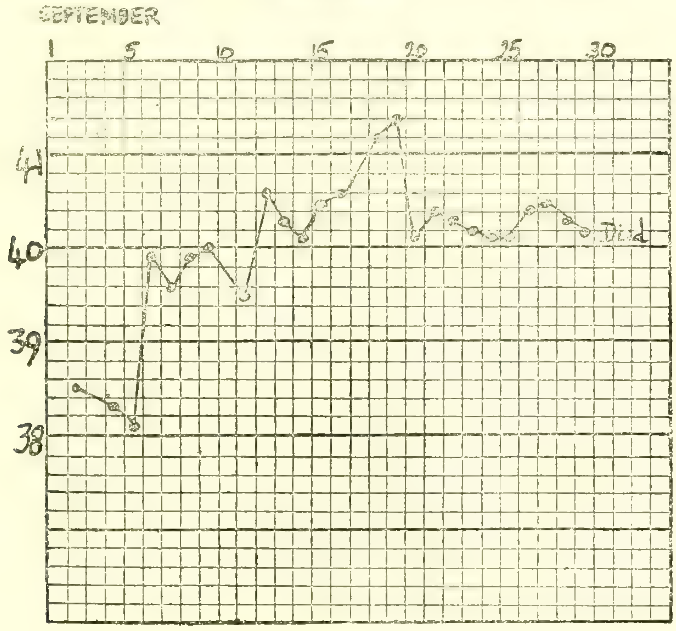
Five days after inoculation on the left side of the neck there was a local tumour measuring 7 by 5 cm. by about 2 cm. in thickness ; the prescapular gland was enlarged, 7 cm. in length.

On the 12th day the tumour measured 14 by 10 by about 4 cm. ; it was prominent and firm except in the centre where a sense of deep fluctuation was obtained. The prescapular gland was considerably enlarged, 10 cm. in length.

On the 21st day the tumour measured 16·5 by 12·7 cm., and the tissues around the inferior extremity were oedematous. The calf was unwell ; there was some loss of flesh, its coat was staring, and there was slight increase in respiration.

On the 29th day the calf was killed. During the previous week it had continued to lose flesh and to become weaker ; the respirations were also obviously increased in frequency but were not very rapid ; the animal would probably have lived two or three days longer.

Temperature.



Tuberculin Test.—The calf was not tested subsequent to inoculation.

Weights.

	Kilogrammes.
September 5, 1905	41·27
September 19, 1905	43·53
September 30, 1905	39·45

Total loss of weight during experiment.—1·82 kilogramme.

POST-MORTEM EXAMINATION.

Carcass.—In poor condition.

Local lesion.—At the seat of inoculation on the left side of the neck there was a tumour, weighing with the skin and muscles to which it was attached 793 grammes, and measuring 14 by 11·5 by 6 cm. On section it showed between the skin and muscles a mass of firm pinkish yellow caseo-necrotic tissue, containing in the upper part a cavity, 6·5 by 4 by 2·5 cm., filled with clear reddish serous fluid. The muscles internal to the mass were fibroid, and infiltrated for a considerable depth with yellow caseous nodules; the nodules were for the most part arranged in lines which ran parallel to the muscle fibres.

The skin was firmly adherent, and closely beset with yellow tubercles; opposite the cavity it was deeply congested.

There was a moderate amount of oedema fluid in the tissues around the local tumour, particularly near the inferior part.

Left Prescapular Gland.—The left prescapular gland weighed 170 grammes, and measured 10 by 5 by 4 cm. On section it was composed throughout of dense tissue, chiefly uniform and pinkish yellow in colour, but in parts greyish and translucent, and mottled with a close yellow network.

At the inferior extremity of the prescapular gland there was a gland the size of a small marble, composed of translucent tissue, moderately well advanced in caseation.

Prepectoral Glands.—The rounded prepectoral gland on the left side, the size of a Barcelona nut, was tense and closely beset with minute whitish foci.

The kidney-shaped prepectoral gland was much enlarged and firmer than normal, but showed only one or two caseous foci; a smaller gland more posterior was similarly affected.

Cervical Glands.—Along the left side of the trachea there was a chain of half a dozen glands, the largest the size of a pigeon's egg; several resembled the left prescapular, the others were slightly less advanced in caseation.

The left upper cervical gland, the size of a walnut, was composed throughout of dense yellow caseous tissue; a large gland near the latter showed a caseating mass in one part of the cortex, and in the rest scattered greyish white tubercles.

Just within the entrance to the thorax, on the left side, there was a large gland, composed of dense translucent tissue, containing a close yellow caseous network.

In the middle of the neck, on the right side, there was a gland the size of a small bean, composed of grey translucent tissue with a yellow network. All other glands on this side were slightly enlarged, and showed irregular caseous foci.

Thorax.

Heart.—On the endocardium of the right ventricle one grey point was seen; otherwise the heart was normal.

Pleura.—On the pleural surface of the diaphragm there were about eight nodules, the largest the size of a wheat grain; one was loosely attached and haemorrhagic. There were a few similar nodules on the fringes along the margins of the ribs; also here and there clusters of minute grey granules.

Lungs.—The ventral part of the left cephalic lobe and the ventral portions of the right cephalic and middle lobes were, with the exception of a few lobules along the margins, dark red and quite airless; in the anterior parts of the caudal lobes there were a few isolated solid lobules. The lung tissue was moderately closely beset with grey tubercles, slightly opaque in the centre, the largest about one millimetre in diameter. The tubercles appeared to be rather more numerous in the solid than in the crêpitant portions. The bronchi in the collapsed areas were filled with muco-pus.

Bronchial and Mediastinal Glands.—The bronchial and mediastinal glands were moderately enlarged. The cortices were composed of firm grey tissue, containing an opaque yellow caseous network.

One infratracheal gland resembled the bronchial; another was enlarged and oedematous, but showed no caseous foci.

Trachea.—The mucous membrane of the anterior end of the trachea showed three or four slightly raised elongated greyish tubercles containing caseous points.

Abdomen.

Omentum.—On the inferior surface there were fairly numerous lenticular nodules, the largest the size of a wheat grain. All were yellow in the centre, and the majority were loosely attached, some being deeply hæmorrhagic.

Parietal Peritoneum.—Normal.

Spleen.—The spleen weighed 283 grammes. The pulp was closely beset with yellow caseous tubercles, somewhat irregular in outline, and ranging up to about 2 millimetres in diameter.

Liver.—The liver contained very numerous tubercles, evenly distributed throughout the substance. The tubercles were grey, and ranged in size from a mere point up to about 1 millimetre in diameter, the larger ones showing opaque yellow centres; some of the tubercles on the surface, under the capsule, were flattened out to a greater diameter.

Gall Bladder.—Under the mucous membrane of the gall bladder there were three yellow pinhead-sized tubercles.

Portal Glands.—The portal glands were enlarged and very oedematous; they showed in the cortices grey translucent tissue, chiefly in the form of nodules, speckled with white caseous foci.

Kidneys.—The left kidney showed on the surface, as well as in the depth of the cortex, moderately numerous grey tubercles, the largest about 1 millimetre in diameter, the smallest just visible; the larger ones were definitely opaque in the centre.

The right kidney showed similar tubercles.

Suprarenal Bodies.—In the cortex of the left suprarenal three minute grey tubercles were seen.

In the right suprarenal two or three very minute grey points were seen.

Alimentary Tract.

Tongue.—On the right side of the tongue there was one minute grey tubercle.

Pharynx.—Normal.

Tonsils.—Each tonsil contained a few caseous tubercles.

Small Intestine.—The Peyer's patches contained sparsely scattered opaque whitish tubercles, smaller than a pin's head.

Large Intestine.—Normal.

Mesenteric Glands, Gastric Glands, Colic Glands.—These glands contained scattered discrete caseating miliary tubercles.

Testes.—Normal.

Eyes.—Normal.

Various Lymphatic Glands.

Precrural, Popliteal, Gluteal, Ischiatic, Pudic, Lumbar, Iliac.—These glands contained fairly numerous discrete tubercles, somewhat irregular in outline, ranging in size up to 1·5 and 2 millimetres; the tubercles were all caseous in the centre.

Right Prescapular, Right Prepectoral, Axillary (Right and Left).—They contained similar discrete caseating tubercles.

Parotid, Submaxillary, Pharyngeal, Renal.—In the parotid, submaxillary, and pharyngeal glands, and in the renal gland, the tubercles were rather more numerous.

Coeliac.—The coeliac glands were a little enlarged, and showed in the cortices early caseous foci in a grey translucent matrix.

Several haemolymph glands contained small caseous tubercles.

VIRUS P. VIII.

(May 11, 1905.)

SUBMAXILLARY GLAND.

Culture Inoculations, September 5, 1905.

The strain was derived from the original material, and had been in cultivation a total period of 117 days.

The culture used was the 5th generation, 20 days old.

CALF 328.

Subcutaneous.
Dose : 50 mg.
Died October 3, 1905.
28 days.

P.M.—General Tuberculosis, severe.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
427	Intrav.	0·1 mg.	D. 18 days.	G. T.
424	Intrap.	1·0 mg.	D. 18 ,,	G. T.
426	Intrap.	0·1 mg.	D. 27 ,,	G. T.
429	Intrap.	0·01 mg.	D. 32 ,,	G. T.
425	Subcut.	1·0 mg.	D. 62 ,,	G. T.
428	Subcut.	0·1 mg.	D. 87 ,,	G. T.

CALF 328. Virus P. VIII.

Subcutaneous inoculation of culture derived from the original material of Virus P. VIII.

Dose—50 milligrammes.

Date—September 5, 1905.

Weight at Inoculation—34·0 kilogrammes. [Age about 6 weeks.]

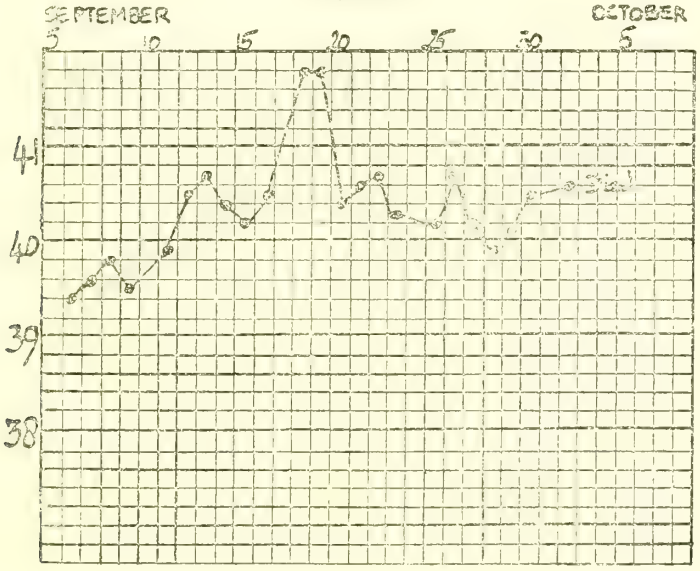
Died—October 3, 1905. [28 days after inoculation.]

Clinical Notes.

Eight days after inoculation on the left side of the neck, there was a local tumour measuring 9 by 5·5 cm. ; the adjacent prescapular gland was slightly enlarged, 6·5 cm. in length.

On the 17th day the tumour measured 14 by 9 cm., it was pear shaped in outline, and about 2·5 cm. thick. The prescapular gland was very large and measured 12·5 cm. in length. Up to this time the general condition of the animal had been good ; it now began to lose weight, and became thin and ill. The progress of the disease was very rapid and the animal died on the 28th day after inoculation.

Temperature.



Tuberculin Test.

The calf was not tested subsequent to inoculation.

Weights.

	Kilogrammes.
September 5, 1905	34·0
September 19, 1905	36·28
September 26, 1905	35·37
October 3, 1905	31·29

Total loss of weight.—2·71 kilogrammes.

POST-MORTEM EXAMINATION.

Local Lesion.—At the seat of inoculation in the subcutaneous tissues on the left side of the neck there was a flattened tumour, weighing 340 grammes, and measuring 14 by 9 by 4 cm. It was composed of a dense yellowish network of caseous tissue, softening in the centre, where there was a small cavity containing turbid fluid.

Left Prescapular Gland.—The left prescapular gland weighed 170 grammes, and measured 10 by 6·5 by 4·5 cm., and was adherent to the subjacent muscle. It was firm, and the cortex was infiltrated with a yellow caseous network, the hilum containing discrete tubercles.

Left Prepectoral Glands.—The left prepectoral (reniform) gland measured 2·5 by 2 cm. It was oedematous, and contained in the cortex four yellowish foci about a pinhead in size. The round prepectoral gland was firm, and infiltrated with irregular caseous foci.

Right Prescapular Gland.—The right prescapular gland contained fairly numerous opaque yellow tubercles, about 1 millimetre in diameter.

Cervical Glands.—The cervical glands on the left side in the mid cervical region contained numerous very minute opaque foci. A lower cervical gland, three centimetres long, contained at one extremity a few isolated tubercles, and at the other numerous minute caseous foci. On the right side the cervical glands contained fairly numerous minute caseous foci in the cortices.

Thorax.

Heart.—In the muscle of the heart there was one grey tubercle; the valves and endocardium were normal.

Lungs.—The left lung was closely filled with grey tubercles, opaque in the centre, varying in size up to 1·5 millimetre, and becoming confluent in patches. The anterior lobe was solid and sank in water.

The substance of the right lung was similarly filled with tubercles, and the greater part of its anterior and middle lobes, and the apex of the posterior lobe were solid and airless.

Bronchial Glands.—The right bronchial gland was firm and infiltrated with yellow caseous foci.

The left bronchial gland contained numerous minute foci in the cortex.

Mediastinal Glands.—The posterior mediastinal glands were infiltrated throughout the cortex with yellow caseous foci. Four other glands contained foci numerous but still discrete.

Thyroid.—On the posterior part of the thyroid cartilage internally were nine flattened translucent tubercles, caseous in the centre, and up to 2·5 millimetres in diameter.

Trachea.—There were four similar tubercles down the trachea.

Abdomen.

Omentum.—On the omentum were sparsely scattered flattened grey tubercles, opaque in the centre, about 1·5 millimetre in diameter.

Spleen.—The spleen weighed 283 grammes, and was closely packed with greyish opaque miliary tubercles.

Liver.—In the liver were numerous grey tubercles, caseous in the centre, varying in size from a pinpoint up to 1·5 millimetre.

Portal Glands. — The portal glands contained numerous minute opaque foci in the cortices, giving them a yellowish granular appearance.

Gall Bladder.—In the mucous membrane of the gall bladder were ten opaque tubercles, the largest the size of a pinhead.

Kidneys.—The kidneys contained sparsely scattered grey tubercles with caseous centres, from a point up to 1 millimetre in diameter.

Alimentary Tract.

Pharynx, Tongue.—On each side of the pharynx, on the folds at the root of the tongue, were four small opaque tubercles.

Tonsils.—The tonsils were normal.

Intestines.—Sparsely scattered over the mucous membrane of the small intestine were minute yellowish tubercles. There were a few in the Peyer's patches.

Large intestine normal.

Mesenteric Glands.—In all the mesenteric glands there was a moderate number of opaque slightly yellow tubercles, varying in size up to a small shot.

Ileo-Colic Glands.—In the ileo-colic glands a few pinhead-sized opaque tubercles were visible, and the substance felt firm.

Lymphatic Glands.

Gastric, Coeliac, Precrural, Popliteal, and Gluteal.—They contained numerous minute opaque yellow tubercles.

Axillary, Iliac, Sacro-Iliac, Lumbar, and Retro-pharyngeal. — All contained rather larger caseous tubercles.

Parotid.—In the parotid lymphatic glands there were several yellow tubercles, the largest almost equal to a wheat grain in size.

The haemolymph glands contained caseous foci.

VIRUS P. IX.

(May 18, 1905.)

SUBMAXILLARY GLAND.

Culture Inoculations, September 20, 1905.

The strain was derived from the original material, and had been in cultivation a total period of 125 days.

The culture used was the 7th generation, 20 days old.

CALF 334.

Subcutaneous.
Dose : 50 mg.
Died : November 4, 1905.
45 days.

P.M.—General Tuberculosis, severe.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
469	Intrav.	0·1 mg.	D. 16 days	G. T.
466	Intrap.	1·0 mg.	D. 20 „	G. T.
468	Intrap.	0·1 mg.	D. 30 „	G. T.
465	Subcut.	10·0 mg.	D. 28 „	G. T.
467	Subcut.	1·0 mg.	D. 51 „	G. T.
470	Subcut.	0·1 mg.	D. 80 „	G. T.

CALF 334. Virus P. IX.

Subcutaneous inoculation of culture derived from the original material of Virus P. IX.

Dose—50 milligrammes.

Date—September 20, 1905.

Weight at Inoculation—41·72 kilogrammes. [Age about 9 weeks.]

Died—November 4, 1905. [45 days after inoculation.]

Clinical Notes.

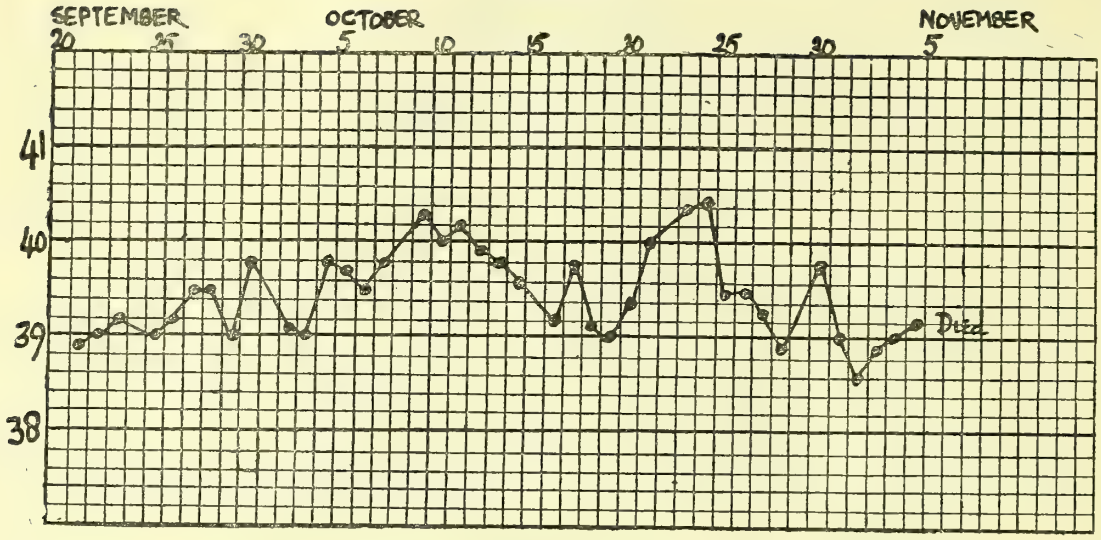
Ten days after inoculation on the left side of the neck an elongated local tumour had developed, extending into the dewlap ; it measured superficially 15 by 7·5 cm. The adjacent prescapular gland was enlarged, 7·5 cm. in length ; the prepectoral gland was the size of a large marble.

On the 20th day the tumour was very large, extending from the middle of the neck to below the level of the trachea ; it measured 18 by 12·5 cm. and projected considerably. There was a large amount of oedema in the dewlap and around the inferior part of the tumour.

The prescapular gland was 12·5 cm. long, and the prepectoral gland was very large ; the animal was beginning to lose flesh and its coat was rough, its respiration was not much increased.

On the fortysecond day the tumour measured about 23 by 12·5 cm. and was very prominent and thick, extending into the dewlap and surrounded at the lower part by much oedema. The animal was much emaciated, the appetite poor, and the respiration increased though not to a marked degree. Weakness and emaciation increased, and the calf died three days later.

Temperature.



Tuberculin Test.—The calf was not tested subsequent to inoculation.

Weights.

	Kilogrammes.
September 20, 1905...	41·72
September 26, 1905	43·08
October 5, 1905	41·72
October 10, 1905	43·08
November 4, 1905	40·36

Total loss of weight during experiment.—1·36 kilogramme.

POST-MORTEM EXAMINATION.

Carcass.—Emaciated.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a very large tumour measuring 20·5 cm. vertically, 12·5 cm. from side to side and 5·5 cm. in greatest thickness; it extended into the loose tissues of the neck and under the trachea slightly to the opposite side; on removal it weighed with the infiltrated skin and muscles 907 grammes; on section it showed between the skin and muscles a mass of dense yellow caseo-necrotic tissue, spongy and juicy in the centre, 3 cm. in greatest thickness; the skin was thickened thoroughly adherent to the necrotic mass and extensively infiltrated with caseous tubercles; the epidermis was cracked and could be peeled off from the greater part of the tumour exposing a red granular surface; the muscles for a depth of 2·5 cm. were closely studded with yellow caseous nodules and showed a great increase in interstitial connective tissue. Between the local tumour and the nearest glands there were several thickened caseous lymphatic vessels.

The tissues around the lower part of the tumour were oedematous.

Left Prescapular Gland.—The left prescapular gland weighed 170 grammes, and measured 9·5 by 4·5 by 5·5 cm.; on section it was composed throughout of dense pinkish yellow caseated tissue very slightly gritty from calcification (the muscles around the gland were tightly adherent to the capsule but not infiltrated).

Left Prepectoral Glands.—The rounded prepectoral gland was a little over 2·5 cm. in diameter and resembled the prescapular. The reniform gland, 3·5 cm. in length, was oedematous and showed part of the cortex composed of reddish grey tissue beset with early caseous foci.

Cervical Glands.—On the left side the superior cervical gland showed part of the cortex composed of greyish red tissue beset with caseous foci; a mid-cervical gland, the size of a thrush's egg, was indurated and caseating throughout (not so advanced as the prescapular); two smaller glands nearer the thorax were indurated and showed streaks and foci of caseation; a gland, the size of a pigeon's egg, close to the entrance to the thorax was dense yellow and caseous throughout; the corresponding gland on the opposite side was enlarged and showed a small patch of the cortex yellow and caseous, the rest translucent and closely beset with yellow caseous foci: other cervical glands on the right side contained each a few caseous nodules.

Abdomen.

Omentum and Peritoneum.—The omentum showed numerous discrete flattened nodules ranging in size from a millet seed to a split pea; they were firm, yellowish in the centre and greyish red around the margins. On the parietal peritoneum there was one loosely attached lenticular nodule about the size of a split pea.

Spleen.—The spleen was very firm and much enlarged (weight 538 grammes). On the surface there were two flattened caseating nodules, the largest 5 mm. in diameter: on section the pulp was packed with irregular yellow caseous nodules with reddish margins ranging up to about 5 mm. in diameter.

Liver.—The liver was enlarged and pale; on the surface under the capsule numerous nodules ranging in size from 1 to about 5 mm. in diameter were seen; the larger ones were slightly raised above the surface and on section were thin and compressed; in the depth of the liver there was numerous evenly distributed yellow caseous tubercles, the largest about 2 mm. in diameter.

Gall Bladder.—The gall bladder showed one submucous caseous tubercle.

Portal Glands.—The portal glands were enlarged and showed in the cortices irregular coalescing nodules with caseous centres and grey margins.

Kidneys.—The left kidney showed in the cortex moderately numerous tubercles ranging in size from a pin's head to a wheat grain; they were yellow and caseous in the centre and had grey translucent margins; scattered about was a number of minute points just visible to the eye; most of these were grey, a few were yellowish.

The right kidney contained similar tubercles; they were however not so numerous and generally smaller.

Suprarenal Bodies.—The suprarenal bodies were pale; no tubercles seen.

Thorax.

Heart.—Under the pericardium covering the right auricle there was a caseous tubercle a little smaller than a wheat grain; otherwise the heart was normal.

Pleura.—Along the margins of the ribs chiefly in the dorsal regions were lines of vascular vegetations containing flattened caseating tubercles up to 1·5 mm. in diameter. On the pleural surface of the diaphragm there were numerous patches of slightly raised reddish vegetations containing small yellowish white tubercles; there were similar patches on the caval fold of pleura and on the pleura covering the pericardium.

Lungs.—The lungs were heavy; the cephalic and right middle lobes were dark-red and almost completely solid; on the surfaces of the right cephalic and middle lobes were some small patches of yellow slightly adherent lymph; the antero-ventral parts of the caudal lobes were dark red and consolidated, and in the rest of these lobes there were irregular patches of consolidation. The lung substance was moderately closely beset with yellow caseating tubercles ranging in size from a pin's head to a wheat grain; they appeared to be most numerous in the solid parts of the lung; the subpleural tubercles in the anterior lobes were considerably flattened out. The cut surfaces of the caudal lobes exuded frothy oedema fluid.

Thoracic Lymphatic Glands.—The caudal mediastinal gland was much enlarged and showed the cortex composed of firm translucent grey tissue mottled with irregular yellow patches of caseation in places forming a network; the medulla was deeply congested and oedematous. The other dorsal mediastinal glands and the bronchial glands were similarly affected but a little more advanced in caseation.

The ventral mediastinal and the vertebral glands and a gland in the caval fold of pleura contained discrete yellow caseous nodules.

Trachea.—The trachea was filled with froth and showed on the mucous surface three slightly raised congested tubercles.

Alimentary Tract.

Tongue, pharynx, and larynx.—Normal.

Tonsils.—The tonsils showed each one or two small caseous nodules.

Small Intestines.—In the long Peyer's patch there was a moderate number of softened caseous tubercles, the largest about 1·5 mm. in diameter; in the rest of the intestine they were sparsely scattered.

Large Intestine.—Normal.

The Gastric, Mesenteric and Colic Glands resembled the precrural.

Ileo-colic Glands.—The ileo-colic glands were enlarged, and showed the cortices composed of firm greyish red tissue beset with irregular caseous foci.

Various Lymphatic Glands.—The precrural, popliteal, gluteal, pudic, parotid, submaxillary, axillary, right prescapular and right prepectoral glands contained a moderate number of irregular yellow caseous nodules ranging up to 3·5 or 4 mm. in diameter.

The left axillary gland was deeply congested, oedematous, and much enlarged; the right prescapular was slightly enlarged and congested.

The lumbar and right renal glands were enlarged and closely beset with caseous nodules becoming confluent.

The coeliac glands were enlarged and composed throughout of very dense translucent tissue mottled with irregular yellow patches of caseation.

All the haemolymph glands contained caseous nodules.

Testes.—Normal.

VIRUS P. XI.

(June 1, 1905.)

SUBMAXILLARY GLAND.

Culture Inoculations, September 6, 1905.

The strain was derived from the original material, and had been in cultivation a total period of 97 days.

The culture used was the 4th generation, 20 and 21 days old.

CALF 338.

Subcutaneous.
Dose : 46·5 mg.
Died : October 13, 1905.
37 days.

P.M.—General Tuberculosis, severe.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
438	Intrav.	0·1 mg.	D. 19 days	G. T.
436	Intrap.	1·0 mg.	D. 17 „	G. T.
439	Intrap.	0·1 mg.	D. 23 „	G. T.
440	Intrap.	0·1 mg.	D. 27 „	G. T.
442	Intrap.	0·01 mg.	D. 29 „	G. T.
437	Subcut.	1·0 mg.	D. 120 „	G. T.
441	Subcut.	0·1 mg.	D. 62 „	G. T.

CALF 338. Virus P. XI.

Subcutaneous inoculation of culture derived from the original material of Virus P. XI.

Dose—46·5 milligrammes.

Date—September 6, 1905.

Weight at Inoculation—31·75 kilogrammes. [Age about 6 weeks.]

Died—October 13, 1905. [37 days after inoculation.]

Clinical Notes.

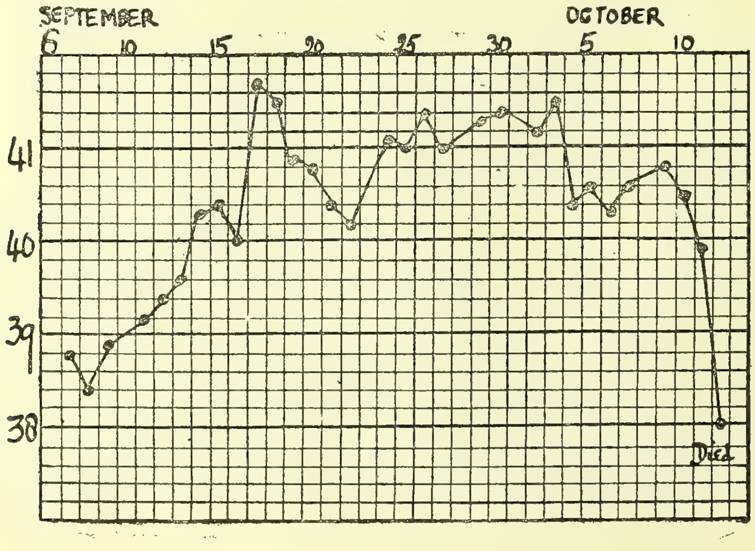
Seven days after inoculation on the left side of the neck there was a firm local tumour adherent to skin and slightly adherent to muscle, measuring 7·5 by 5 cm., and about 1·25 cm. thick. The adjacent prescapular gland was slightly enlarged, 6·5 cm. in length.

On the 24th day the tumour was elongated, measuring 15 by 7 cm. by about 2·5 cm. in thickness ; the prescapular gland was moderately enlarged, 9 cm. in length ; the prepectoral gland was slightly enlarged. The general condition of the animal was not very good.

On the 34th day the animal's condition was poor, its coat was rough, and there was slight emaciation ; respiration 48, somewhat jerky.

Three days later the calf died.

Temperature.



Tuberculin Test.—The calf was not tested subsequent to inoculation.

Weights.

	Kilogrammes.
September 6	31·75
September 12	33·55
September 19	34·91
September 26	32·65
October 13	26·30

Total loss of weight.—5·43 kilogrammes.

Rate of loss per week.—1·04 kilogramme.

POST-MORTEM EXAMINATION.

Carcass.—In poor condition.

Local Lesion.—The tumour at the seat of inoculation on the left side of the neck was lenticular in outline, measuring 12·5 by 7 cm. by a little over 2·5 cm. in greatest thickness, and weighing with skin and muscles 226 grammes. It was composed of the usual pinkish yellow caseo-necrotic tissue, showing in the centre a series of small spaces filled with yellow serous fluid.

The muscles were infiltrated for a short distance; the skin was thickened, and studded with yellow tubercles, particularly over the centre of the tumour.

Left Prescapular Gland.—The left prescapular gland weighed 141 grammes, and measured 9 by 6 by 4 cm. On section it consisted throughout of dense pinkish yellow caseated tissue.

Left Prepectoral Glands.—One, the size of a pigeon's egg, showed the cortex firm and in a state of early caseation; the medulla was distended with oedema fluid. Another gland was enlarged, oedematous, and contained discrete yellow tubercles.

Cervical Glands.—A small gland in the middle of the neck on the left side showed the greater part of the cortex in a state of early caseation; other cervical glands contained discrete caseous tubercles.

Thorax.

Heart.—Normal.

Parietal Pleura.—The parietal pleura showed a few flattened caseating nodules, and here and there a slight hypertrophy of the lymphatic fringes, at the base of some of which minute grey granules were seen.

Diaphragm.—On the pleural surface of the diaphragm there was one small flattened caseating nodule, and slight hypertrophy of the lymphatic fringes.

Lungs.—The lungs were moderately closely beset with yellow caseous tubercles, ranging in size from a small point to a little over 1 millimetre in diameter; they were somewhat irregular in outline, and showed a tendency to occur in small groups. The right cephalic lobe, with the exception of the thin dorsal border, and the ventral portion of the right middle lobe, were extensively hepatised, being firm, heavy, and dark red. In the ventral portion of the left cephalic lobe and the antero-ventral portions of the caudal lobes there were patches of consolidation, irregular in outline, and not sharply defined, pieces from which sank in water. On the dorsal surface of the right caudal lobe there was a large patch of collapse, which appeared to be of old standing. In other parts of the lung single tubercles and groups of tubercles were surrounded by angular red patches. One of these patches showed early tuberculous infiltration.

Mediastinal Glands.—The caudal mediastinal gland was moderately enlarged, and showed the cortex dense, yellowish, and far advanced in caseation, very little grey translucent tissue remaining; the medulla was congested and oedematous.

Other mediastinal and the bronchial glands were similarly affected. They weighed together 85 grammes.

The infratracheal, oesophageal, ventral and mediastinal glands, and the glands in the caval fold, contained discrete yellow caseous tubercles.

Trachea.—On the mucous membrane in the anterior part of the trachea there was one caseous tubercle.

Abdomen.

Omentum.—On the inferior surface of the omentum were scattered lenticular loosely attached nodules, ranging up to 2 millimetres in diameter; all had yellow centres, and some were congested.

Spleen.—The spleen was enlarged, weight 283 grammes. The pulp was closely packed with yellow caseous nodules with greyish red margins, the largest about 2 millimetres in diameter.

Liver.—The liver contained moderately numerous opaque caseous tubercles, ranging in size from 0·5 or less up to 1 millimetre in diameter; they were evenly distributed throughout the substance.

Gall Bladder.—The gall bladder showed one pinhead-sized submucous tubercle, and three or four small ulcers with caseous floor and congested margins.

Portal Glands.—The portal glands were enlarged. They showed in the cortices nodular masses of aggregated caseating tubercles.

Kidneys.—The left kidney showed on the surface fairly numerous tubercles with grey margins and yellow centres, the majority the size of a millet seed, some barely visible to the eye. On section many of the larger surface tubercles extended for some distance down into the cortex. A few tubercles were seen in the depth of the cortex.

In the right kidney were similar, but less numerous tubercles. These did not show the same tendency to extend downwards into the cortex.

Suprarenals.—The left suprarenal showed one minute grey tubercle. The right was normal.

Alimentary Tract.

Tongue.—The mucous membrane at the base of the tongue showed two small ulcers with yellow necrotic floors.

Tonsils.—Each tonsil contained a few caseous tubercles.

Small Intestine.—Almost all the Peyer's patches contained pinhead-sized caseous tubercles in small number; they were most numerous in the long Peyer's patch. Caseous tubercles were seen also here and there under the mucous membrane.

Large Intestine.—Normal.

Mesenteric Glands.—The mesenteric glands were not enlarged. They contained discrete caseous tubercles and caseating patches in the cortices.

Gastric Glands and Colic Glands.—These glands contained discrete tubercles.

Various Lymphatic Glands.

Coeliac Glands.—Two coeliac glands were enlarged, firm, and on section showed yellow caseous patches; other coeliac glands contained discrete nodules.

Renal Gland.—The renal gland was enlarged, and closely beset with yellow caseous tubercles, up to 2 millimetres in diameter.

Precrural, Pudic, Popliteal, Gluteal, Ischiatic, Axillary, Right Prescapular, Right Prepectoral, and Parotid.—These glands contained yellow caseous nodules, somewhat irregular in outline, ranging in size up to about 2 millimetres.

Iliac, Ilio-Sacral, Submaxillary and Pharyngeal.—There were similar, but rather more numerous nodules in these glands.

Testes and Eyes.—Normal.

VIRUS P. XII.

(June 26, 1905.)

SUBMAXILLARY GLAND.

CULTURE INOCULATIONS, DECEMBER 14, 1905.

The strain was derived from the original material, through G.P. 1636, and had been in cultivation a total period of 101 days.

The culture used was the 5th generation, 20 days old.

CALF 376.
Subcutaneous.
Dose : 50 mg.
Killed when dying:
Jan. 2, 1906. 19 days.
P.M.—General Tuberculosis, severe.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
597	Intrav.	0·1 mg.	D. 19 days	G. T.
598	Intrap.	1·0 mg.	D. 16 „	G. T.
600	Intrap.	0·1 mg.	D. 18 „	G. T.
602	Intrap.	0·01 mg.	D. 75 „	G. T.
599	Subcut.	1·0 mg.	D. 97 „	G. T.
603	Subcut.	0·1 mg.	D. 105 „	G. T.
601	Subcut.	0·01 mg.	D. 89 „	G. T.

CULTURE INOCULATIONS, JUNE 29, 1906.

The strain was derived from the original material, through G.P. 1636, and had been in cultivation a total period of 298 days.

The culture used was the 9th generation, 21 days old.

CALF 444.
Subcutaneous.
Dose : 50 mg.
Killed when dying :
Aug. 16, 1906. 48 days.
P.M.—General Tuberculosis, severe.

CALF 450.
Subcutaneous.
Dose : 50 mg.
Died : Aug. 9, 1906.
41 days.
P.M.—General Tuberculosis, severe.

CALF 376. Virus P. XII.

Subcutaneous inoculation of culture derived from the original material of Virus P. XII through G.P. 1636.

Dose—50 milligrammes.

Date—December 14, 1905.

Weight at Inoculation—39·46 kilogrammes. [Age about 6 weeks.]

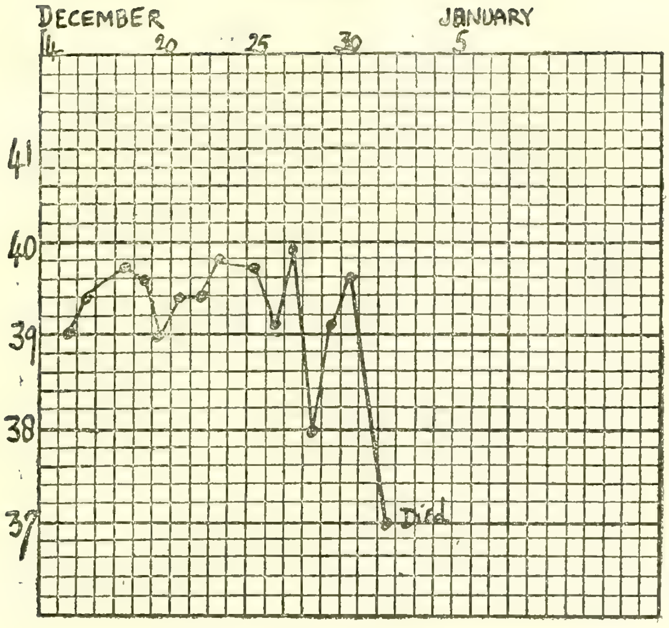
Killed when dying—January 2, 1906. [19 days after inoculation.]

Clinical Notes.

Seven days after inoculation on the left side of the neck there was a local tumour measuring 10 by 5 cm.; the adjacent prescapular gland was enlarged, 6 cm. in length; the prepectoral gland was the size of a walnut.

On the 18th day the calf became suddenly ill, refusing food. On the following morning it was found in a moribund condition, and was therefore killed.

Temperature.



Tuberculin Test.—The calf was not tested subsequent to inoculation.

Weights.

	Kilogrammes.
December 14, 1905	39·46
January 2, 1906	33·55

Total loss of weight.—5·91 kilogrammes.

POST-MORTEM EXAMINATION.

General Condition.—Moderate.

Local Lesion.—At the seat of inoculation there was a tumour, which measured 9 by 5·5 cm. in superficial area. On section it consisted of congested yellow necrotic tissue, broken down in the centre to form thin watery fluid, turbid with caseous flakes. At this part the necrotic tissue infiltrated the muscles, and was about an inch in thickness. The greater part of the tumour, however, was thin, and situated wholly in the subcutaneous tissue.

Two thickened caseous lymphatic vessels extended from the local tumour towards the prescapular gland.

Left Prescapular Gland.—The left prescapular gland weighed 56 grammes, and measured 8 by 4·5 by 2·5 cm. On section the cortex was composed practically throughout of dense pinkish yellow caseo-necrotic tissue.

Right Prescapular Gland.—The right prescapular gland appeared normal.

Prepectoral Glands. — The rounded prepectoral gland measured nearly 2·5 cm. in diameter, and was composed throughout of dense pinkish yellow caseonecrotic tissue; the reniform gland was enlarged, and showed part of the cortex firm, and in a state of early caseation.

The prepectoral glands on the right side appeared normal.

Axillary Glands.—The axillary glands appeared normal.

Cervical Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—The lungs showed in various parts firm red patches of collapse with a lobular outline; they were largest in the right cephalic and middle lobes. The lung substance contained numerous grey translucent tubercles, mostly about 0·5 millimetre in diameter; the tubercles appeared to be most numerous in the anterior lobes.

Trachea.—Normal.

Thoracic Glands.—The caudal mediastinal gland was slightly enlarged and firmer than normal. On section the cortex showed in some places a fine yellow network, in others irregular caseous foci, singly or in small groups. Other mediastinal and the bronchial glands were in a similar condition, but a little more extensively caseated.

Heart.—Muscle and valves normal.

Abdomen.

Omentum.—The omentum showed on the under surface a few minute congested tubercles. In the omental sac there was some yellowish turbid fluid together with flakes of lymph. Between the omentum, along its attachment, and the stomach, there was a band of yellow fibrinopurulent exudation, which contained clear serous fluid in the centre.

Stomach.—Near the pylorus, on the ventral surface of the stomach, there was an oval aperture, covered by omentum, which adhered to the margins. On the mucous surface the opening was seen to be situated in the centre of an ulcer, one inch in greatest diameter The ulcer appeared to be of old standing, the margins being raised, thickened, and somewhat puckered; the base was thin, and showed in the centre the opening described above. Near the large ulcer there were two smaller ulcers with thickened margins.

Intestines.—Normal.

Mesenteric Glands.—There were a few doubtful tubercles in the mesenteric glands.

Spleen.—The spleen weighed 170 grammes. On the convex surface there was a thin layer of fibrinous lymph. On section the pulp was dark red, moderately firm, and showed no tubercles.

Liver.—The liver was firm and dark red, and showed throughout the substance moderately numerous opaque minute tubercles.

Gall Bladder.—Normal.

Portal Glands.—The portal glands were slightly enlarged, and beset in the cortices with irregular caseous foci.

Kidneys. — Each kidney showed in the cortex numerous grey ill-defined tubercles, the largest about 1 millimetre or less in diameter.

Suprarenals.—The right suprarenal body contained several minute pearly grey tubercles. The left appeared normal.

Lumbar Glands.—The lumbar glands contained a moderate number of irregular caseous foci.

Coeliac Glands.—One coeliac gland showed part of the cortex firm and grey, with early caseous foci.

Iliac Glands.—Each iliac gland showed one or two greyish white tubercles.

Genito-Urinary System.

Testes.—Normal.

Bladder.—The bladder was greatly distended; its mucous membrane was normal.

Special Glands.

Right Precrural.—Contained two caseous foci.

Left Precrural.—Normal.

Pudic.—One pudic gland contained a caseous focus; the other was normal.

Gluteal and Left Popliteal.—Each contained a few caseous foci.

Ischiatic, Submaxillary, and Parotid.—Normal.

Retropharyngeal.—Each contained one or two small grey tubercles.

Tongue, Tonsils, Pharynx, and Larynx.—Normal.

Eyes.—Normal.

Microscopical Examinations.

Pharyngeal Gland.—Numerous tubercle bacilli.

Gluteal Gland.—Numerous tubercle bacilli.

Mesenteric Gland.—No tubercle bacilli.

CALF 444. Virus P. XII.

Subcutaneous inoculation, on left side of neck, of culture derived from original material of Virus P. XII through G.P. 1636.

Dose—50 milligrammes.

Date—June 29, 1906.

Weight at Inoculation—37·19 kilogrammes. [Age about 7 weeks.]

Killed when dying—August 16, 1906. [48 days after inoculation.]

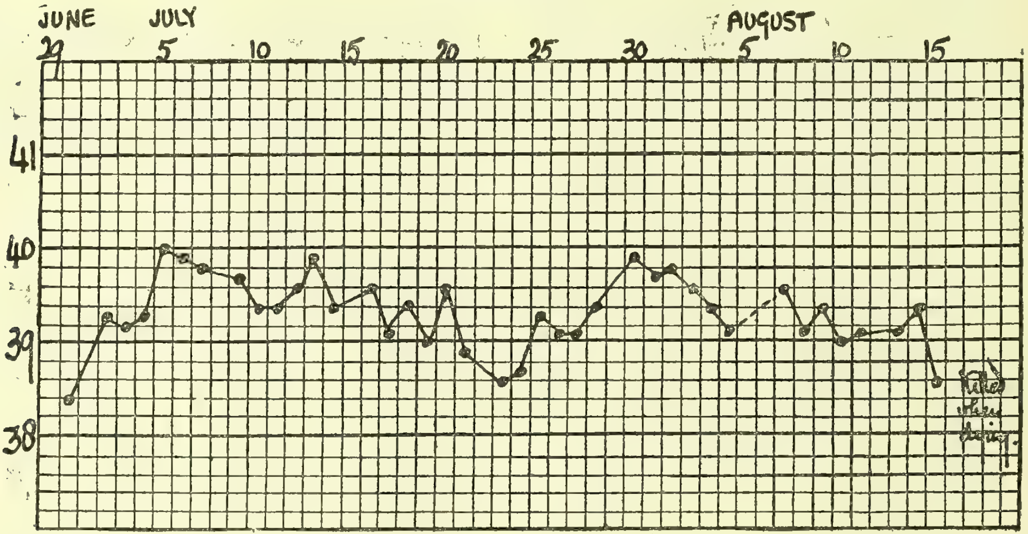
Clinical Notes.

Seven days after inoculation on the left side of the neck a flat subcutaneous thickening could be felt, 10 by 6·5 cm. in area; the adjacent prescapular gland was enlarged, measuring 7·5 cm. in length.

On the fourteenth day there was a firm prominent infiltrating local tumour measuring 14 by 9 cm.; the prescapular gland measured 10 cm. in length.

The tumour continued to increase in size; on the fortieth day it measured 20 by 10 cm., and the gland was 12·7 cm. in length. The calf was unwell, the respiration was distinctly increased, and it was apparently losing flesh. The progress of the disease was subsequently very rapid, and the calf was killed when in a dying condition 8 days later.

Temperature.



Tuberculin Test.—The calf was not tested subsequent to inoculation.

Weights.

	Kilogrammes.
June 29, 1906	37·19
August 16, 1906	36·73

Total loss of weight during experiment.—460 grammes.

POST-MORTEM EXAMINATION.

General Condition.—Thin.

Local Lesion.—At the seat of inoculation, on the left side of the neck, there was a large firm tumour weighing, with skin and muscles to which it was attached, 538 grammes, and measuring 19 by 9 cm., by nearly 5 cm. in greatest thickness. On section it was lenticular in outline, and composed of pinkish yellow caseo-necrotic tissue a little spongy and juicy in the centre but containing no large cavity. The skin was thickened, universally adherent and beset with yellow caseous tubercles, principally over the central part of the tumour. The muscles were infiltrated and caseous, to a greater extent and depth under the upper part of the tumour than under the lower.

Left Prescapular Gland.—The left prescapular gland weighed 170 grammes, and measured 9 by 5 by 5·5 cm.

and was composed throughout of dense pinkish yellow caseo-necrotic substance.

Right Prescapular Gland.—The right prescapular gland, not enlarged, contained several yellow caseous nodules, the largest 4 mm. in diameter.

Prepectoral Glands.—The rounded prepectoral gland on the left side, the size of a pea, was indurated and caseous around the cortex.

The kidney shaped gland on the same side was much enlarged and firmer than normal, and showed besides a number of small caseous foci several irregular caseous nodules up to a hemp seed.

The prepectoral glands on the right side contained several small caseous nodules.

Left Cervical Glands.—The glands in the middle of the neck were slightly enlarged, one was indurated and showed a few caseous foci in the cortex, the others contained discrete caseous nodules.

The superior cervical gland contained a number of nodules.

The mastoid gland was slightly enlarged and contained discrete caseous nodules up to a hemp seed, and one firm caseous nodule the size of a French bean.

Right Cervical Glands.—The cervical glands on the right side contained nodules similar to those in the peripheral lymphatic glands.

Axillary Glands.—The axillary glands contained nodules similar to those in the right prescapular.

Thorax.

Pleura.—The costal pleura was normal. On the pleura covering the diaphragm there was a loosely attached caseating nodule the size of a hemp seed.

Lungs.—The lungs were moderately closely beset with firm greyish yellow caseating nodules ranging in size from a pin's head to a small pea. The nodules were most numerous in the ventral portions of the lobes while in several places they were aggregated together and confluent. The nodules under the pleura were slightly raised above the surface and flattened. On section similar nodules were seen throughout the parenchyma; here and there in the depth were caseating masses occupying some part of a lobule; the ventral portions of the cephalic lobe and the antero-ventral portions of the caudal were diffusely consolidated but still air-containing; elsewhere in the lung single nodules and small groups of nodules were surrounded by angular red zones of consolidation.

Thoracic Glands.—Just within the entrance to the thorax there was a firm gland the size of a pheasant's egg which was dense yellow and caseous throughout.

The bronchial and mediastinal glands showed a moderate degree of enlargement. On section the cortices were firm and far advanced in caseation, only a small amount of grey translucent tissue remaining between the caseous areas.

Heart and Pericardium.—Normal.

Larynx and Trachea.—Normal.

Abdomen.

Omentum and Peritoneum.—On the ventral surface of the omentum there were three firm flattened lenticular nodules with yellow centres, the largest about 2 mm. in diameter. There was no hypertrophy of the fringes. The peritoneum was normal.

Spleen.—The spleen was small, weighing 113 grammes. It showed evenly distributed throughout the pulp a moderate number only of yellow firm tubercles, the largest a little larger than a millet seed.

Liver.—The liver at first sight appeared normal; on close inspection, however, a few very sparsely scattered opaque greyish white tubercles, the largest not more than 5 mm. in diameter were seen. On section similar tubercles were sparsely scattered throughout the substance.

Gall Bladder.—Normal.

Portal Glands.—The portal glands were moderately enlarged and closely beset with coalescing caseous nodules arranged principally in groups.

Kidneys.—The left kidney showed on the surface four greyish-white translucent pinhead sized tubercles; none was seen in the depth.

On the surface of the right kidney there were two or three tubercles similar to those on the left, and also a few minute grey foci. In the depth of the cortex one pinhead-sized tubercle was seen.

Suprarenal Bodies.—The left suprarenal body contained one pinhead-sized tubercle. The right appeared normal.

Coeliac Glands.—Two coeliac glands were slightly enlarged, they were indurated and showed their cortices extensively caseated; other coeliac glands contained discrete caseous nodules up to a hemp seed in size.

The Iliac, Ilio-sacral, and Lumbar Glands were slightly enlarged and contained discrete caseating nodules.

Renal Gland.—The renal gland was distinctly enlarged, and closely beset with caseous nodules.

Alimentary Tract.

Pharynx.—Normal.

Tonsils.—One tonsil contained a pea sized caseous nodule, the other three or four, the largest the size of a hemp seed.

The Submaxillary, Pharyngeal, and Parotideal Glands contained numerous firm yellow caseous nodules, the largest 5 mm. in diameter.

Gastric Glands.—The gastric glands contained discrete caseous nodules.

Intestines.—All the Peyer's patches in the small intestine contained yellow caseous nodules up to about 2 mm. in diameter; they were most numerous in the long patch where several showed the mucous membrane over them ulcerated. There were a few nodules under the mucous membrane as well.

Large Intestine: Beneath the mucous membrane of the caecum and the early part of the colon there were numerous raised congested softened caseous nodules, the largest a little larger than a millet seed.

Mesenteric Glands.—The mesenteric glands were slightly enlarged and showed their cortices composed practically throughout of firm tissue in an advanced stage of caseation, but not so advanced as in the thoracic glands.

Colic Glands.—The colic glands contained discrete caseous nodules similar to those in the gastric glands.

Testes.—Normal.

Eyes.—Normal.

Various Peripheral Lymphatic Glands.

The Precrural and Pudic Glands contained numerous discrete firm yellow caseating nodules somewhat irregular in outline, the largest about the size of a hemp seed.

The Popliteal and Gluteal Glands resembled the precrural. One *Ischiatic gland* contained a caseating nodule.

Haemo-lymph Glands all over the body contained single caseous nodules up to a hemp seed in size.

CALF 450. Virus P. XII.

Subcutaneous inoculation of culture derived from the original material of Virus P. XII, through G.P 1636.

Dose—50 milligrammes.

Date—June 29, 1906.

Weight at Inoculation—36·74 kilogrammes. [Age about 7 weeks.]

Died—August 9, 1906. [41 days after inoculation.]

Clinical Notes.

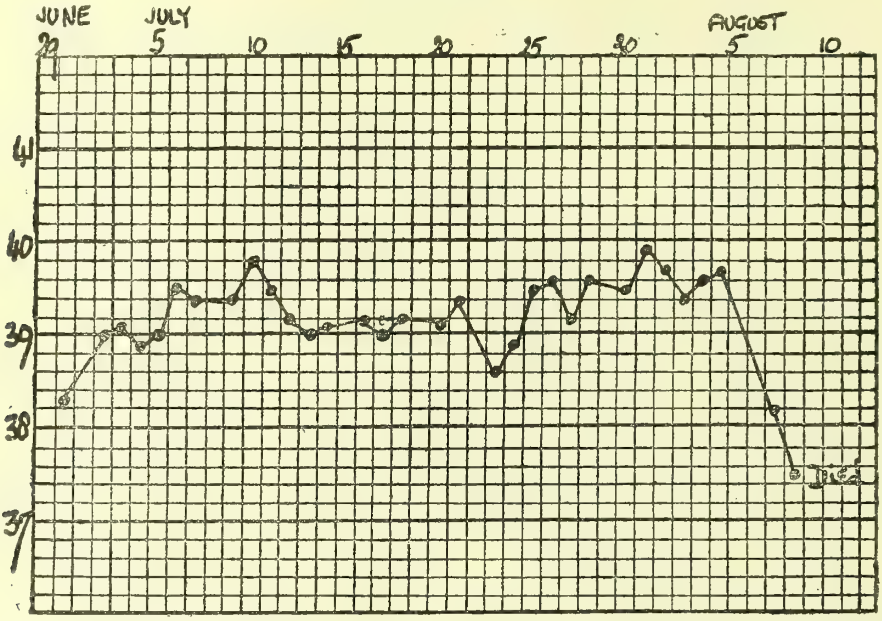
Seven days after inoculation on the left side of the neck there was a slightly raised firm local tumour measuring 7·5 by 5·5 cm. The prescapular gland was slightly enlarged, about 5 cm. in length.

On the fourteenth day the tumour measured 10 by 6 cm.; the adjacent muscles were slightly infiltrated, and there was some oedema of the dewlap. The prescapular gland was considerably enlarged, 10 cm. in length.

The tumour continued to increase in size; on the twenty-eighth day it measured 12·5 by 7·5 cm. by about 1 cm. in thickness.

On the thirty-first day the respiration of the calf was increased in frequency; on the thirty-eighth day the animal was acutely ill; it was wasting and lay on the floor most of the day, the respiration was laboured but not very frequent. Three days later the calf was dead.

Temperature.



Tuberculin Test.—The calf was not tested subsequent to inoculation.

Weights.

	Kilogrammes.
June 29, 1906	36·74
August 9, 1906	34·46

Total loss of weight during experiment.—2·28 kilogrammes.

POST-MORTEM EXAMINATION.

General Condition.—Thin.

Local Lesion.—At the seat of inoculation, on the left side of the neck, there was an oval tumour measuring 12·5 by 7·5 cm., by 3·2 cm. in greatest thickness, composed of yellow congested caseo-necrotic tissue infiltrating to a slight extent the muscles. The interior part of the tumour was spongy and juicy and softer than the peripheral part. The skin was everywhere adherent, and over the central part was infiltrated up to the surface and completely replaced by softening caseous substance; elsewhere the skin showed discrete yellow tubercles.

Left Prescapular Gland.—The left prescapular gland weighed 141 grammes, and measured 9 by 6·5 by 4 cm.; on section the cortex, except for a small patch at one extremity which contained discrete caseous tubercles, was composed of dense yellow somewhat congested caseous tissue.

Right Prescapular Gland.—The right prescapular gland contained discrete yellow caseous nodules.

Left Prepectoral Glands.—Two left prepectoral glands, the size of walnuts, were composed throughout of very dense yellow caseated tissue slightly congested and not perceptibly gritty.

Another gland, kidney shaped, 4 cm. in length, was oedematous and showed the cortex firmer than normal and beset with very minute early caseous foci.

Right Prepectoral Glands.—Normal.

Cervical Glands.—A left lower cervical gland, slightly enlarged, and firmer than normal, showed in the cortex numerous minute caseous points.

Other cervical glands on this side, and all those on the right, contained discrete yellow caseous nodules.

Axillary Glands.—The left axillary gland was slightly enlarged, and on section similar to the kidney-shaped left prepectoral gland.

The right axillary gland contained discrete yellow caseous nodules.

Thorax.

Pleura.—Along the margins of the ribs were small clusters of minute tubercles surrounded by reddish tissue forming incomplete lines. On the pleural surface of the diaphragm there were a few small congested villous tufts with no tubercles.

Lungs.—The lungs were heavy; the left lobes were extensively consolidated, very little air containing tissue remaining. The right lobes were more diffusely consolidated and were of a terra-cotta colour mottled with irregular dark red patches of consolidation. The lung parenchyma was closely and evenly beset with yellow caseous tubercles varying in size from a mere point up to that of a millet seed.

Thoracic Glands.—The bronchial and mediastinal glands were moderately enlarged, weighing together about 112 grammes. On section the cortices were firm and composed of greyish red translucent tissue well advanced in caseation. The caseous areas formed irregular patches and in some places a coarse network.

Heart (muscle and valves).—Normal.

Larynx.—There was a miliary caseous tubercle in the mucous membrane of the larynx just above the left vocal cord.

Trachea.—The mucous membrane in the upper part of the trachea showed some scattered minute tubercles.

Abdomen.

Omentum and Peritoneum.—On the ventral surface of the omentum there were about half a dozen flattened congested nodules slightly opaque in the centre, the largest slightly larger than a millet seed.

The parietal peritoneum was normal.

Spleen.—The spleen was soft and slightly atrophied, it weighed a little over 141 grammes. On section the pulp contained a moderate number of discrete firm yellowish tubercles ranging in size from a pin's head to a millet seed.

Liver.—The liver was normal in size, and contained, evenly distributed, a moderate number only of greyish white tubercles ranging in size from a mere point to that of a pin's head.

Portal Glands.—The portal glands were slightly enlarged and closely beset in the cortices with caseating tubercles showing a tendency to form groups.

Kidneys.—The kidneys contained rather numerous grey tubercles, the largest 1 mm. in diameter, with minute opaque yellow centres. Some of these tubercles were elongated in a radial direction.

Suprarenal Bodies.—The left showed two greyish white tubercles in the cortex ; the right contained one.

The Lumbar and Renal Glands were slightly enlarged and closely beset with caseous nodules tending to coalesce.

Coeliac Glands.—One coeliac gland, slightly enlarged, was composed of firm grey tissue mottled with irregular yellow caseous foci. Other coeliac glands contained more or less discrete yellow caseous nodules.

Alimentary Tract.

Tongue.—Normal.

Pharynx.—The pharynx was deeply congested, but contained no tubercles.

Tonsils.—Each tonsil contained a few caseous nodules, the largest the size of a hemp seed.

The Pharyngeal, Submaxillary and Parotid Glands were slightly enlarged, and contained numerous yellow caseous nodules varying in size up to that of a hemp seed.

Intestines.—The small intestine showed throughout its whole length numerous caseous tubercles, the largest the size of millet seed. These occurred chiefly in Peyer's patches and were most numerous in the long patch. There were a few caseous nodules in the caecum and the first part of the colon.

Gastric Glands.—The gastric glands were slightly enlarged and beset with caseous tubercles.

Mesenteric Glands.—The mesenteric glands contained numerous caseating nodules, which in some had coalesced.

Ileo-Colic Glands.—The ileo-colic glands were closely beset with tubercles.

Colic Glands.—The colic glands were slightly enlarged and beset with caseous tubercles.

Testes.—Normal.

Eyes.—Normal.

Various Lymphatic Glands.

The Precrural Glands contained moderately numerous discrete yellow caseous nodules somewhat irregular in outline with narrow grey margins, the largest about the size of a hemp seed.

The Pudic, Iliac, Ilio-sacral, Popliteal, and Gluteal Glands contained similar nodules.

Several haemo-lymph glands contained discrete caseous nodules.

VIRUS P. XIV.

(July 13, 1905.)

SUBMAXILLARY GLAND.

CULTURE INOCULATIONS.

(a) JUNE 29, 1906.

The strain was derived from the original material, through G.P. 1623, and had been in cultivation a total period of 290 days.

The culture used was the 12th generation, 21 days old.

CALF 446.
Subcutaneous.

Dose : 50 mg.
Died : Sept. 17, 1906.
80 days.

P.M.—Slight general tuberculosis. Death from cystitis and nephritis, caused by urinary calculi.

CALF 448.
Subcutaneous.

Dose : 50 mg.
Killed when moderately well :
October 11, 1906.
104 days.

P.M.—General progressive tuberculosis of moderate severity.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
694	Intrav.	0·1 mg.	D. 19 days	G. T.
695	Intrap.	1·0 mg.	D. 10 ,,	Early G. T.
699	Intrap.	0·1 mg.	D. 19 ,,	G. T.
698	Subcut.	0·01 mg.	D. 58 ,,	G. T.

CULTURE INOCULATIONS.
April 16, 1907.

The strain was derived from the lung of Calf 448 and had been in cultivation a total period of 187 days.

The culture used was the 8th generation, 21 days old.

CALF 536.
Subcutaneous.

Dose : 50 mg
Died : June 1, 1907.
46 days.

General tuberculosis, severe.

CALF 538.
Subcutaneous.

Dose : 50 mg.
Died : May 22, 1907.
32 days.

General tuberculosis, severe.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1304	Intrav.	0·1 mg.	D. 19 days.	G. T.
1306	Subcut.	10·0 mg.	D. 78 ,,	G. T.
1305	Subcut.	1·0 mg.	D. 42 ,,	G. T.

CULTURE INOCULATIONS.
July 23, 1907.

The strain was derived from the prescapular gland of Calf 538 and had been in cultivation a total period of 62 days.

The culture used was the 4th generation, 19 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1426	Intrav.	1·0 mg.	D. 16 days.	G. T.
1427	Intrav.	0·1 mg.	D. 17 ,,	G. T.
1428	Subcut.	10·0 mg.	D. 61 ,,	G. T.

VIRUS P. XIV.—*continued.*

CULTURE INOCULATIONS—*continued.*

(*b*) APRIL 16, 1907.

The strain was derived from the original material, through G.P. 1623, and had been in cultivation a total period of 581 days.

The culture used was the 21st generation, 21 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1307	Intrav.	0·1 mg.	D. 67 days.	G. T.
1308	Subcut.	1·0 mg.	D. 72 „	G. T.
1292	Subcut.	10·0 mg.	D. 99 „	G. T.

CALF 532.

Subcutaneous.

Dose : 50 mg.

Died : July 1, 1907.

76 days.

P.M. — General tuberculosis; severe in the lungs.

CALF 534.

Subcutaneous.

Dose : 50 mg.

Killed : July 12, 1907.

87 days.

P.M. — General progressive tuberculosis of moderate severity.

CULTURE INOCULATIONS.

OCTOBER 14, 1907.

The strain was derived from the spleen of Calf 534, and had been in cultivation a total period of 94 days.

The culture used was the 4th generation, 21 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1518	Intrav.	1·0 mg.	D. 19 days	G. T.
1517	Intrav.	0·1 mg.	D. 17 „	G. T.
1519	Subcut.	10·0 mg.	D. 58 „	G. T
1516	Subcut.	1·0 mg.	D. 80 „	G. T.

(*c*) JULY 16, 1907.

The strain was derived from the original material, through G.P. 1623, and had been in cultivation a total period of 672 days.

The culture used was the 23rd generation, 21 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life	Result.
1407	Intrav.	1·0 mg.	D. 21 days	G. T.
1406	Intrav.	0·1 mg.	D. 45 „	G. T.
1409	Subcut.	10·0 mg.	D. 201 „	G. T.
1408	Subcut.	1·0 mg.	D. 177 „	G. T.

CALF 446. Virus P. XIV.

Subcutaneous inoculation of culture derived from the original material of Virus P. XIV, through G.P. 1623.

Dose—50 milligrammes.

Date—June 29, 1906.

Weight at Inoculation—36·74 kilogrammes. [Age about 5 weeks.]

Died—September 17, 1906. [80 days after inoculation.]

Clinical Notes.

Seven days after inoculation on the left side of the neck there was a flat local thickening measuring 7·5 by 5 cm.; the adjacent prescapular gland was very slightly enlarged. On the fourteenth day a firm slightly raised tumour had developed, which measured 10 by 6 cm. The gland was slightly enlarged, 5 cm. in length.

On the fortieth day the local conditions were unchanged. The general condition of the calf was fair.

On the fifty-fifth day the tumour was firm and measured 11·5 by 6·2 cm., by about 7·5 cm. in thickness; the gland was 6 cm. in length. The calf was not in very good condition, and seemed a little weak, but there was no increase in the respiration, and the appetite was good. Three weeks later the local conditions were unchanged; the calf was thin but apparently not ill. Three days later it died.

Temperature.—The temperature was irregular during the experiment but was at no time very high, the maximum range of variation being from 38·2° C. to 39·8° C.

Tuberculin Test.—The calf was not tested subsequent to inoculation.

Weights.

	Kilogrammes.
June 29, 1906	36·74
September 17, 1906	34·01

Total loss of weight during experiment.—2·73 kilogrammes.

POST-MORTEM EXAMINATION.

General Condition.—Fair.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a firm flattened tumour measuring 11 by 5·7 cm., by 1·7 cm. in greatest thickness, composed of dense yellowish white caseo-necrotic tissue adherent both to skin and muscle but not infiltrating either to any extent.

Left Prescapular Gland.—The left prescapular gland measured 5·7 by 4 cm. by about 2 cm.; on section the greater part of the gland was composed of dense pinkish yellow caseated tissue showing no sign of calcification. A little normal gland tissue remained chiefly around the periphery and this contained more or less discrete yellow caseous tubercles.

Right Prescapular Gland.—The right prescapular gland contained one yellow caseous nodule 1·5 mm. in diameter.

Prepectoral Glands.—One on the left side, the size of a sparrow's egg, was dense yellow and caseous throughout; its capsule was thickened.

Other prepectoral glands were normal.

Left Cervical Glands.—One of the left lower cervical glands, a little over 1 cm. in diameter, was indurated and mottled with caseous foci which formed a more or less continuous line around the periphery of the gland; the capsule was much thickened.

A mid-cervical gland contained a yellow caseous focus.

The superior cervical gland contained a yellow caseous nodule a little larger than a millet seed.

Right Cervical Glands.—The right upper cervical gland contained one yellow pinhead tubercle. Other cervical glands on this side were normal.

Mastoid Glands.—The left showed at one extremity a group of yellow caseous tubercles. The right was normal.

Axillary Glands.—Normal.

Thorax.

Pleura.—The parietal pleura on the last few ribs on the right side showed a number of small connective tissue outgrowths, in the apices of which small hard tubercles, some caseous some hæmorrhagic, could be felt.

Lungs.—The lungs collapsed normally and showed scattered throughout, not very numerous, firm nodules ranging in size from a pin's head to a hemp seed; on section they were yellow and caseous, and in the majority of cases surrounded by a small angular dark red zone; they appeared to be most numerous in the caudal lobes. In the anterior lobes there were some large areas of collapse. In the posterior parts of the caudal lobes there were some small consolidated lobules which were either homogeneously red throughout or showed early caseous infiltration.

Thoracic Glands.—The bronchial and mediastinal glands were not apparently enlarged; they contained fairly numerous more or less discrete yellowish white caseous tubercles ranging up to about 2 mm. in diameter.

Heart.—Normal.

Abdomen.

The peritoneal cavity contained a small quantity of yellow turbid fluid suspended in which were flakes of yellow pus.

The bladder was greatly distended, the serous surface was markedly injected and covered with a layer of yellowish fibrino-purulent material. The serous membranes in contact with it, *i.e.* of the rumen and left kidney, were congested and covered with yellow fibrinous lymph. On incision the bladder was found to be filled with dark red bloody fluid, and to contain rather a large quantity of gravel. The mucous membrane was congested and deeply hæmorrhagic; the wall of the bladder was thickened.

Kidneys.—The left kidney was enlarged, the pelvis and calyces were dilated, their walls being thickened, and contained numerous concretions; the cortex was tough, most of the lobules showing on the surface a greyish mottled appearance; on section these grey areas extended into the cortex as radial streaks. In several places the cortex showed yellow purulent areas. The capsule stripped badly and the perirenal tissue was much increased in amount.

The right kidney was slightly larger than normal, and showed an oedematous condition of the pelvis and calyces, with a few scattered concretions. The surface was speckled with petechial hæmorrhages, and the cortex showed a marked increase of interstitial connective tissue, with here and there some greyish radial streaks.

No tubercles were seen in either kidney.

Suprarenal Bodies.—Normal.

Spleen.—The spleen was normal in size, and showed on section sparsely scattered firm yellowish tubercles, the largest the size of a millet seed.

Liver.—The liver appeared normal on the surface and on section.

Portal Glands.—The portal glands, little if at all enlarged, contained discrete firm yellow caseous nodules ranging in size from a pin's head to a hemp seed.

Coeliac Glands.—One coeliac gland was slightly enlarged, and closely beset with firm irregular yellow caseous nodules up to a hemp seed in size.

Lumbar Glands.—The lumbar glands were enlarged. The largest contained three or four yellow millet seed sized tubercles and a few smaller greyish yellow foci.

Alimentary Tract.

Tongue.—Normal.

Tonsils.—In one tonsil a soft yellow tubercle was found.

Submaxillary Glands.—Each contained three or four yellow caseous nodules, the largest 1·5 mm. in diameter.

Pharyngeal Glands.—Each contained numerous yellow caseous tubercles, the largest a little larger than a millet seed.

Intestines.—The terminal Peyer's patch of the small intestine contained about a dozen softened caseous nodules up to a hemp seed in size, over which the mucous membrane was congested and ulcerated. Another patch just in front of this contained one similar nodule. The large intestine was normal.

Mesenteric Glands.—The terminal mesenteric glands were slightly enlarged and showed on section firm yellow caseous masses which extensively replaced the gland substance; the other glands contained scattered caseous nodules up to about 1 cm. in diameter.

Ileo-colic Glands.—One ileo-colic gland showed several large caseous areas, another showed a small caseous patch.

Colic Glands.—Two colic glands were partly caseous.

Pharynx, Larynx.—Normal.

Testes.—Normal.

Eyes.—Normal.

Various Peripheral Lymphatic Glands.

Popliteal Glands.—The left showed in the cortex a pin-head sized yellow caseous tubercle. The right was normal.

Precrural Glands.—Normal.

Gluteal and Ischiatic Glands.—Normal.

Pudic Glands.—Normal.

Microscopic Examinations.

Tubercle from Tonsil. — Tubercle bacilli very numerous.

Tubercle from Lumbar Gland.—Three tubercle bacilli seen.

Tubercle from Intestine.—Tubercle bacilli very numerous.

CALF 448. Virus P. XIV.

Subcutaneous inoculation of culture derived from the original material of Virus P. XIV, through G.P. 1623.

Dose—50 milligrammes.

Date—June 29, 1906.

Weight at Inoculation—31·75 kilogrammes. [Age about 5 weeks.]

Killed when moderately well—October 11, 1906. [104 days after inoculation.]

Clinical Notes.

Seven days after inoculation on the left side of the neck there was a flat local thickening 7·5 by 5 cm. in area; the adjacent prescapular gland was very slightly enlarged. On the fourteenth day there was a slightly raised firm flattened local infiltration measuring 9 by 6 cm.; the prescapular gland was slightly enlarged, 5 cm. in length.

On the fortieth day the tumour at the seat of inoculation was small and slightly raised, measuring 9·5 by 5·5 cm.; the gland was 7·5 cm. in length. The left prepectoral gland was enlarged.

On the seventy-seventh day the tumour was smaller (7·5 by 4·5 cm.) and softening in the centre. The calf was thin, but not ill. Twenty-four days later it was killed; it was then in poor condition: there was some inspiratory dyspnoea and an occasional cough.

Temperature.—The temperature was irregular during the experiment, but at no time was it very high, the maximum range of variation being 1·8° C. (38·0° C.–39·8° C.).

Tuberculin Test.—The calf was not tested subsequent to inoculation.

Weights.

	Kilogrammes.
June 29, 1906	31·75
October 11, 1906	45·35

Total gain of weight during experiment.—13·60 kilogrammes.

Average rate of gain per week.—907 grammes.

POST-MORTEM EXAMINATION.

Carcass.—Condition fair.

Local Lesion.—At the seat of inoculation in the subcutaneous tissues of the left side of the neck there was a flattened pear-shaped tumour 8·3 by 5 by 2 cm. On section it consisted of yellow caseo-necrotic substance with scattered calcareous streaks; the centre was beginning to break down forming a small cavity. It was adherent to skin and muscle, in both of which there were scattered caseous tubercles.

Left Prescapular Gland. — The left prescapular gland measured 5·8 by 3 by 4 cm. On section about one third of the gland consisted of semi-translucent caseated tissue with yellowish white calcareous streaks. In the rest of the gland the cortex was in part caseous and in part contained discrete caseous tubercles. The medulla showed scattered caseous nodules.

Right Prescapular Gland.—Normal.

Prepectoral Glands.—A left prepectoral gland was replaced by caseated tissue, with yellow calcareous streaks and foci mainly around the periphery. A second gland was enlarged and had the cortex filled with confluent caseous gritty nodules. Right prepectoral glands normal.

Axillary Glands.—Normal.

Cervical Glands. — A left lower cervical gland was enlarged and caseous throughout with calcareous streaks. Of the left middle cervical glands one was almost entirely caseous and two others contained caseous nodules. The left superior cervical gland was normal. The right superior cervical gland contained a single irregular caseous nodule with calcareous foci. One right middle cervical contained two caseous nodules. The right inferior cervical gland was normal.

Thorax.

Pleura and Diaphragm.—Normal.

Lungs.—The anterior and middle lobes of the right lung contained numerous nodules which projected from the surface and measured up to 1 cm. in diameter. In places they had become confluent forming larger masses. The majority showed a tendency to soften and from some the whole soft caseous centre could be picked out, leaving a translucent capsule. In the lung substance between the nodules were dark congested areas. The posterior lobe presented much the same appearance, but in many parts the nodules had run together, forming large caseous masses. The softening was more marked, some being caseo-purulent throughout and showing the early stages of cavity formation.

The left lung was similar to the right except that in the centre of the posterior lobe there was a caseo-purulent mass replacing about one-third of the substance.

Thoracic Glands.—The long mediastinal gland was large and the greater part of the cortex was filled with irregular confluent caseo-calcareous nodules; the rest of the gland showed discrete tubercles and nodules. Two other mediastinal glands were more than half replaced by firm caseated tissue with calcareous streaks and foci.

The right bronchial glands were enlarged and almost entirely caseous. The left were filled with caseated tissue similar to that in the mediastinal glands.

Heart and Pericardium.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—The spleen weighed 141 grammes. Beneath the capsule could be seen scattered tubercles projecting slightly from the surface. On section the pulp contained moderately numerous discrete yellow caseous tubercles up to a hemp seed in size. The majority of these contained fine calcareous streaks in the centre.

Liver.—On the anterior convex surface there were three small slightly projecting tubercles with filmy marginal expansions. Just beneath the surface and sparsely scattered throughout the substance were tubercles varying from a grey point up to a millet seed. The largest were caseous with grey margins and gritty centres.

Portal Glands.—The portal glands (four in number) were enlarged and the cortices were closely filled with firm caseous nodules with grey margins and yellow calcareous centres.

Kidneys.—In the cortices there were a few scattered minute grey foci and an occasional grey tubercle with an opaque calcareous centre.

Suprarenal Bodies.—The right showed two caseous tubercles the size of rape seed with calcareous centres. The left contained three similar tubercles.

Intestines.—In the first part of the small intestine there were scattered nodules up to 5 mm. in diameter occurring both in the Peyer's patches and in the mucous membrane. They projected internally and in the centres of some there were small openings. On section the majority consisted of soft caseous substance. The rest were of translucent tissue with soft yellow centres. In the lower part of the intestine only occasional nodules were met with in the Peyer's patches. One had a small ulcer in the centre, the base of which was formed by soft caseous tissue.

Mesenteric Glands.—The mesenteric glands contained numerous nodules varying in size from a pea to a pigeon's egg. They were separated from each other by normal gland tissue or tissue with a few caseous foci. The nodules consisted of a caseous network embedded in firm translucent tissue similar to that in the bronchial glands.

Colic Glands.—The colic glands were enlarged and their cortices were almost entirely replaced by a fibro-caseous network with calcareous foci.

Gastric Gland.—One gastric gland contained a caseous nodule.

The Tongue, Larynx, Pharynx, Tonsils, and Trachea were normal.

Special Glands.

Coeliac Glands.—One gland was replaced by confluent caseo-calcareous nodules. Two others showed irregular caseo calcareous tubercles.

Lumbar Gland.—One lumbar gland was filled with caseous gritty nodules.

Renal, Left Iliac, Right Precrural, Gluteal, Left Popliteal, Left Ischiatic, Posterior Pharyngeal Glands.—These glands contained a varying number of discrete caseous nodules.

Right Iliac, Left Precrural, Right Popliteal, and Left Parotid Glands were normal.

CALF 532. Virus P. XIV.

Subcutaneous inoculation of culture derived from the original material of Virus P. XIV. through Guinea-pig 1623.

Dose—50 milligrammes.

Date of Inoculation—April 16, 1907. [Age about 11 weeks.]

Died—July 1, 1907. [76 days after inoculation.]

Temperature.

The temperature began to rise about the 7th or 8th day after inoculation and reached 39·9 on the 17th day; subsequently there was irregular pyrexia (max. 39·9).

Weights.

	Kilogrammes.
April 16, 1907	39·90
July 1, 1907	39·90

POST-MORTEM EXAMINATION.

Condition.—Poor.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a tumour measuring 12·7 by 7·5 by 5 cm. On section it was found to be a cyst filled with a clear serous fluid with a few flakes and small masses of caseo-necrotic substance; the inner walls were shaggy and lined by a thin layer of caseo-necrotic substance slightly gritty. There was a little infiltration of both skin and muscle.

Left Prescapular Gland.—The left prescapular gland measured 8 by 3·8 by 3 cm., the periglandular tissue was oedematous. On section it showed about two-thirds of its cortex completely caseous with a tendency to central softening, and in the other third a close network of yellow caseous tissue.

Right Prescapular Gland.—The right prescapular gland measured 5 by 2·2 by 1·2 cm. On section it was congested and contained a few scattered caseous nodules and a small collection at one extremity.

Left Prepectoral Glands.—The left spherical prepectoral gland was enlarged and caseous throughout. The left reniform gland was enlarged and oedematous and showed the cortex beset with caseous tubercles.

Left Cervical Glands.—The left inferior cervical gland showed discrete caseous tubercles. The left superior cervical gland was oedematous and contained one small collection of caseous tubercles.

The Right Prepectoral and Cervical Glands were oedematous but contained no tubercles.

The Axillary Glands on both sides were oedematous but otherwise normal.

Thorax.

Pleura.—Normal.

The Tissues of the Posterior Mediastinum were markedly oedematous.

Lungs.—The lungs were voluminous and did not collapse; they were congested and the anterior lobes on both sides, the right lobe, and the ventral margins of the caudal lobes were solid and airless; they were reddish grey in colour and were fairly closely beset with yellow caseous nodules and patches. The posterior portions of the caudal lobes were also severely affected, containing large firm pneumonic patches beset with caseous nodules; in some of these whole lobules were caseous throughout.

Trachea.—Normal.

Thoracic Glands.—The long mediastinal gland was enlarged, measuring 10·5 by 3·2 by 2 cm. On section the cortex was firm and was closely beset, but not entirely replaced, by irregular waxy caseous nodules The other mediastinal and bronchial glands were similar to the long mediastinal gland.

Heart and Great Vessels appeared normal.

Abdomen.

Omentum.—In the omentum there was one grey submiliary tubercle.

Peritoneum.—Normal.

Spleen. — The spleen weighed 70 grammes. On section it contained moderately numerous discrete yellow caseous nodules varying from a rape-seed up to a hemp seed in size; the majority were of the larger size and were softened in the centre.

Liver.—On the convex surface beneath the capsule there was one minute grey tubercle. On the inferior surface there were two caseating miliary tubercles. On section through the substance there was an occasional minute grey tubercle.

The Gall Bladder was normal.

Portal Glands.—The cortices of the portal glands were closely filled with waxy caseous nodules up to a hemp seed in size.

Kidneys.—On the surface of both kidneys there were scattered foci of congestion. In one there was a grey miliary tubercle caseous in the centre and on section slightly elongated, and also a minute grey focus. On the surface of the other kidney there were four grey tubercles with caseous centres varying up to a millet seed; section revealed one more tubercle.

Suprarenal Bodies.—The suprarenal bodies were normal.

Lumbar Glands.—The lumbar glands contained discrete waxy caseous nodules.

Iliac Glands.—Normal.

Alimentary Tract.

Tongue, Tonsils, Larynx, and Pharynx.—Normal.

Large Intestine.—Normal.

Small Intestine.—In two of the Peyer's patches there were small ulcers with caseous floors.

Gastric Glands.—Several of the gastric glands showed the margins of the cortex caseous.

Mesenteric Glands.—Two or three of the mesenteric glands at each extremity of the mesentery were firm and almost replaced by a yellow caseous network. In the rest of the chain of glands there occurred at intervals caseous nodules varying in size from a wheat grain up to a nodule measuring 2 by 1·5 cm.

Various Lymphatic Glands.

Coeliac Glands.—The coeliac glands were to a considerable extent replaced by a network of yellow caseated tissue.

Submaxillary Glands.—The left submaxillary gland showed one hemp seed sized caseous nodule. The right was normal.

The Parotid Glands showed caseous nodules.

Precrural, Popliteal, Gluteal, Ischiatic, and Posterior Pharyngeal Glands.—Normal.

The caseous lesions showed a greater tendency to soften than to calcify.

Microscopical Examination.

(Smear Preparations.)

Tubercle from Liver.—A few tubercle bacilli.

Bronchial Gland.—Moderately numerous tubercle bacilli.

CALF 534. Virus P. XIV.

Subcutaneous inoculation of culture derived from the original material of Virus P. XIV. through Guinea-pig 1623.

Dose—50 milligrammes.

Date of Inoculation—April 16, 1907. [Age about 11 weeks.]

Killed—July 12, 1907. [87 days after inoculation.]

Temperature.

The temperature began to rise on the 10th day after inoculation, reaching 40·2 on the 14th, and remaining above forty for four days; it then fell and subsequently fluctuated slightly above normal.

Tuberculin Test.

The calf was not tested during the experiment.

Weights.

	Kilogrammes.
April 16, 1907	54·87
July 12, 1907	72·10

Total gain in weight.—17·23 kilogrammes.

POST-MORTEM EXAMINATION.

General Condition.—Good.

Local Lesion.—In the subcutaneous tissues on the left side of the neck there was an elongated tumour weighing with skin and muscle 396 grammes, and measuring 20 by 7·5 by 4 cm. On section it was found to be composed of caseo-necrotic gritty substance with an irregular central cavity containing serous fluid ; it infiltrated both skin and muscle.

Left Prescapular Gland.—The left prescapular gland measured 9·5 by 5 by 4·5 cm. On section it was composed almost throughout of caseo-necrotic tissue with gritty foci ; at one part there was some softening with the formation of a small cavity.

Right Prescapular Gland.—The right prescapular gland was normal.

Left Prepectoral Glands.—The left reniform prepectoral gland was enlarged and closely filled with caseous streaks and foci. The cortex of the left rounded prepectoral gland showed numerous caseous foci.

Cervical Glands.—The left inferior cervical gland was enlarged measuring 3·8 by 2·5 cm. On section about one-third of its cortex was replaced by a caseating gritty nodule ; the remainder was firm grey and beset with caseous foci. The left middle and superior cervical glands were normal.

The Right Cervical Glands were normal.

The Right Prescapular and Right Prepectoral Glands were normal.

Thorax.

Pleura.—The lymphatic fringes in the intercostal spaces were enlarged and congested, and several of them contained flat grey translucent nodules.

Lungs.—The lungs did not collapse normally ; they were crepitant, but a little congested and oedematous. Scattered throughout the substance were moderately numerous irregular grey nodules with a caseous network, varying considerably in size, the largest being about 2 by 3 cm. in area. The majority were surrounded by a zone of congestion.

Trachea.—Normal.

Thoracic Glands.—The long mediastinal gland measured 15 cm. in length by 4·3 cm. in greatest thickness ; on section the cortex consisted of firm grey tissue with a yellowish caseous network slightly gritty in parts ; the small amount of cortical tissue left was deeply congested. The other mediastinal glands were similar.

The Bronchial Glands resembled the mediastinal glands, but there was more firm grey tissue and less caseation.

A Gland at the Entrance to the Thorax on the left side contained a fine caseous yellowish network. One on the right showed a few opaque foci.

The Heart and Great Vessels appeared normal.

Diaphragm.—On the pleural surface of the diaphragm the lymphatic fringes were prominent, forming shaggy grey growths in which could be felt minute hard grey tubercles ; on the peritoneal surface there were a few nodules similar to those in the omentum.

Abdomen.

Omentum.—In the omentum there were scattered translucent nodules varying in size up to about a wheat grain ; the largest were flattened and loosely attached, and a few were congested.

Peritoneum.—Normal.

Intestines.—The small intestine ; in the first part in the mucous membrane there was a circular nodule 1 cm. in diameter with a crater-like ulcer and a caseous base. Along the intestine there were four similar but smaller nodules, two of them being in Peyer's patches.

In the large intestine there were two congested circular ulcers resembling those in the small gut.

The Mesenteric Glands were not severely affected ; many of them showed large single firm grey nodules with a caseous gritty network.

Spleen.—The spleen weighed 170 grammes. On section it contained scattered nodules (30 counted) up to 5 mm. in diameter. On section these consisted of soft caseous substance enclosed within grey translucent capsules.

Liver.—On the ventral surface there were four slightly projecting nodules with fibrinous fringes : four flattened nodules were visible on the convex surface. Attached to the sharp margin but not affecting the substance, there was a pea sized grey nodule caseous in the centre. On section there were sparsely scattered throughout the substance nodules similar to those in the spleen and varying up to a hemp seed in size.

The Gall Bladder was normal.

Portal Glands.—The portal glands contained in the cortices discrete grey nodules caseous in the centre.

Kidneys.—The left kidney showed in the cortex just beneath the surface five minute opaque tubercles. The right kidney contained one tubercle. On section no more were revealed.

Suprarenal Bodies.—The left suprarenal body showed three submiliary caseous tubercles. The right suprarenal body was normal.

The Renal, Lumbar, and Iliac Glands were normal.

Tongue, Tonsils, Larynx, and Pharynx were normal.

Various Lymphatic Glands.

Coeliac Glands.—Three were normal ; in a fourth the cortex was beset with caseous miliary tubercles.

The Precural, Right Gluteal, Popliteal, Submaxillary, Parotid, and Ischiatic Lymphatic Glands were normal.

The Left Gluteal Gland contained a few irregular caseous nodules.

Microscopical Examination.

(Smear Preparation.)

Ulcer from Large Intestine.—Moderately numerous tubercle bacilli.

CALF 536. Virus P. XIV.

Subcutaneous inoculation of culture derived from the lung of Calf 448.

Dose—50 milligrammes.

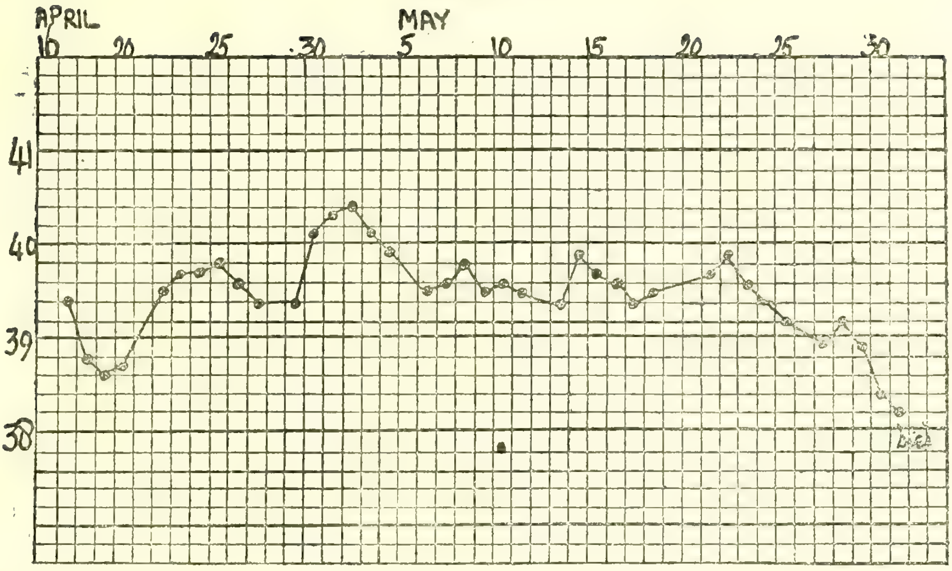
Date of Inoculation—April 16, 1907. [Age about 13 weeks.]

Died—June 1, 1907. [46 days after inoculation.]

Clinical Notes.

The course of the disease was similar to that usually seen in animals acutely infected.

Temperature.



Tuberculin Test.—The calf was not tested subsequent to inoculation.

Weights.

	Kilogrammes.
April 16, 1907	58·50
June 1, 1907	53·05

Total loss of weight.—5·45 kilogrammes.

POST-MORTEM EXAMINATION.

Carcass.—Emaciated.

Local Lesion.—The tumour at the seat of inoculation on the left side of the neck weighed with the attached skin and muscle 368 grammes, measuring 13·5 by 10 by 6·5 cm. It was in close proximity to and adherent to the gland, and the surrounding tissues were oedematous. On section the superficial half consisted of pinkish caseo-necrotic tissue, while the deeper part was composed of caseous tissue infiltrating the muscle and the oedematous tissues.

Left Prescapular Gland.—The left prescapular gland measured 8 by 4·6 by 4 cm. The tissues were adherent to the thickened capsule and on section the gland was composed throughout of firm caseo-necrotic tissue with scattered yellowish white gritty streaks.

Right Prescapular Gland.—The right prescapular gland measured 4·5 by 2 by 1·2 cm. On section it showed moderately numerous irregular caseous tubercles up to a hemp seed in size, and also a few larger collections.

Left Prepectoral Glands.—The left round prepectoral gland, the size of a large pea, was diffusely caseous throughout. The left reniform gland contained discrete caseous nodules in the cortex.

Left Cervical Glands.—The left inferior cervical gland had nearly half the cortex diffusely caseous, while the rest was firm and contained numerous caseous foci. A second deeper gland was caseous throughout. A left middle cervical gland was diffusely caseous almost throughout.

The left superior cervical glands contained discrete irregular caseous nodules.

Right Prepectoral Glands.—A few hempseed sized nodules were found in the reniform gland, and smaller nodules in the rounded gland.

The Right Axillary, and the Superior, Middle, and Inferior Cervical Glands were similar to the right prescapular gland. The left axillary gland contained numerous irregular caseous nodules up to 4 mm.

Thorax.

Pleura.—On the pleural surface of the pericardium there was a single flattened congested nodule. On the parietal pleura there were ten flattened nodules varying in size up to 10 mm.

Lungs.—The lungs were large and did not collapse normally. The substance was closely filled with caseous tubercles with grey margins, for the most part discrete and measuring up to 2 mm. They were most numerous in the anterior and middle lobes where there was considerable lobular congestion, although there still remained a fair amount of normal lung tissue. The ventral part of the right posterior lobe was much more congested, quite airless, and sank in water.

Trachea.—Down the trachea there were a dozen flattened congested nodules with caseous centres.

Thoracic Glands.—The long mediastinal gland measured 15 by 4·5 by 2·3 cm. On section almost the whole cortex was composed of firm grey tissue with a close caseous network. The other mediastinal glands were similar. The remaining part of the cortices of these glands was deeply congested and contained caseous foci.

The bronchial glands were enlarged and resembled the long mediastinal gland.

The glands within the entrance to the thorax on the left side showed the cortices firm and in a condition of early caseation. Those on the right side, and the ventral mediastinal glands, showed numerous irregular caseating nodules with grey margins.

Heart and Great Vessels.—Normal.

Abdomen.

Omentum.—On the omentum there were moderately numerous flattened nodules up to 3 mm. in diameter. The majority were loosely attached, many were deeply congested; they were firm and translucent and almost all showed some caseation in the centre.

Peritoneum.—On the parietal peritoneum there were four flat grey nodules.

Spleen.—The spleen weighed 255 grammes. The vessels on the capsule were injected and there was one flattened grey nodule. On section the substance was closely filled with yellowish caseous nodules with grey margins, varying up to a hempseed in size.

Liver.—The surface of the liver was studded with numerous grey tubercles with irregular caseous centres varying up to 1·5 mm. Some projected from the surface and were flattened and mushroomed. On section the substance showed similar tubercles distributed throughout.

Gall Bladder.—The vessels of the mucous membrane of the gall bladder were injected; on it were two caseous tubercles, and a number of congested spots the centres of which were a little firm; these were not definite tubercles.

Portal Glands.—The portal glands were large and the greater part of the cortices was replaced by a network of caseated tissue.

Kidneys.—The cortices of the kidneys, on the surface and on section, showed scattered grey tubercles with opaque centres up to 1·5 mm. in diameter.

Suprarenal Bodies.—The right was normal; the left showed one opaque submiliary tubercle.

Lumbar, Iliac, and Renal Glands.—The lumbar and iliac glands contained numerous caseous nodules. In the renal glands these had become confluent, almost entirely replacing the gland tissue.

Alimentary Tract.

Tongue.—Normal.

Tonsils.—In the tonsils there was a moderate number of caseous tubercles.

On the laryngeal surface of the epiglottis there was a congested circular ulcer 3 mm. in diameter.

Small Intestines.—Beneath the mucous membrane along the whole length of the small intestine, mainly in Peyer's patches, there were fairly numerous irregular caseous tubercles varying up to a rapeseed in size but here and there attaining the size of a hempseed. Over many there was a small aperture in the mucous membrane.

Large Intestine.—In the large intestine many of the solitary follicles were opaque in the centre.

Gastric Glands.—These glands contained irregular caseous nodules.

Mesenteric Glands.—The mesenteric glands were somewhat enlarged and contained numerous irregular caseous nodules surrounded by firm grey tissue.

Genito-Urinary Systems.

Testes. — Each testis showed a caseous miliary tubercle.

Various Lymphatic Glands.

Coeliac.—The coeliac glands were enlarged. In the largest the cortex was replaced by a caseous network, and the three small ones were similarly though rather less affected.

Precrural Glands.—Showed a moderate number of irregular caseous nodules up to 3 mm.

Pudic Glands.—Enlarged and similar to the precrural.

Popliteal, Gluteal, Ischiatic, and Parotideal Glands all contained irregular caseous nodules.

Retro-pharyngeal Glands. — Closely filled with caseous nodules.

Submaxillary Glands.—The left contained numerous irregular caseous nodules up to 4 mm. in diameter. The right was similar.

Microscopical Examinations.

Foci from Trachea.—Tubercle bacilli numerous.

Nodule from Epiglottis.—Tubercle bacilli scanty.

Focus from Testis.—Tubercle bacilli numerous.

Nodule from Small Intestine. — Tubercle bacilli numerous.

Follicle of Large Intestine. — Tubercle bacilli numerous.

Congested Mucous Membrane of Gall Bladder.—Two tubercle bacilli seen.

CALF 538. Virus P. XIV.

Subcutaneous inoculation of culture derived from the lung of Calf 448.

Dose—50 milligrammes.

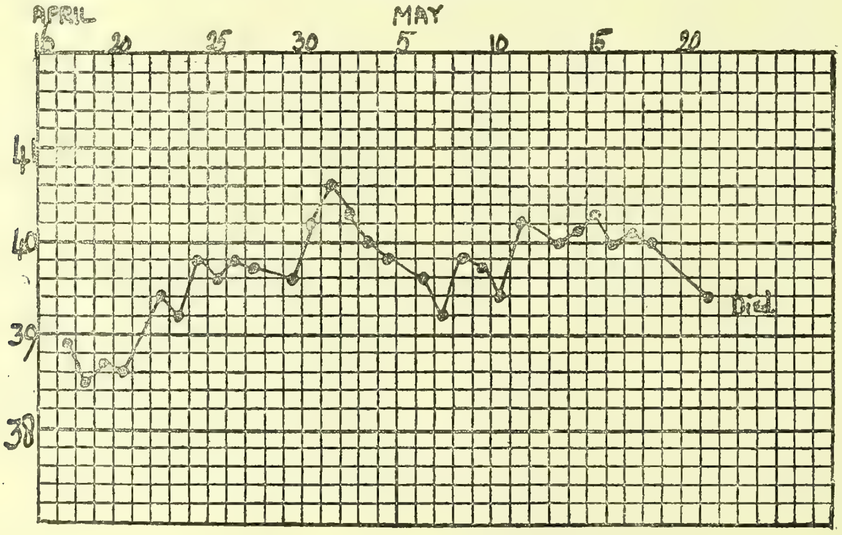
Date of Inoculation—April 16, 1907. [Age about 7 weeks.]

Died—May 22, 1907. [32 days after inoculation.]

Clinical Notes.

The course of the disease was similar to that usually seen in animals suffering from acute tuberculosis.

Temperature.



Tuberculin Test.—The calf was not tested subsequent to inoculation.

Weights

	Kilogrammes.
April 16, 1907	43·99
May 22, 1907	39·00

Total loss of weight.—4·99 kilogrammes.

POST-MORTEM EXAMINATION.

Carcass emaciated.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a slightly prominent tumour measuring 16 by 8 by 5 cm. and weighing 396 grammes. It was adherent to and infiltrated the skin and muscle around. On section it was composed of firm pinkish grey caseo-necrotic tissue. At one extremity of the tumour there was a small cavity containing clear serous fluid.

Left Prescapular Gland.—The left prescapular gland measured 11 by 5·5 by 5·5 cm. and weighed 170 grammes. On section it was composed throughout of dense pinkish yellow necrotic tissue. The capsule was thickened and adherent to the muscles.

The tissues and muscles around the local tumour and prescapular gland were greatly thickened and oedematous, and contained numerous caseous foci and nodules.

Right Prescapular Gland.—The right prescapular gland measured 5 by 2 by 1 cm. On section it was found to contain a moderate number of yellow caseous nodules 5 mm. in diameter.

Left Prepectoral Glands.—These glands were enlarged and contained a few caseating nodules in the cortices.

Cervical Glands.—The left inferior cervical gland was composed practically throughout of dense yellow necrotic tissue similar to that of the left prescapular gland.

The left middle and left upper cervical glands were firm and congested, and showed in the cortices a close network of yellow caseating tissue.

The right cervical glands contained a few irregular caseous tubercles.

Axillary Glands.—The left showed two yellow caseous nodules 5 mm. in diameter. The right contained a few small nodules with caseous foci.

Right Prepectoral Glands.—These were similar to the right axillary gland.

Thorax.

Pleura.—The lymphatic fringes along the margins of the ribs were congested, and showed numerous minute grey tubercles.

On the caval fold and on the right side of the pleural surface of the diaphragm there were some congested fringes containing minute grey tubercles.

Lungs.—The lungs were very heavy. The left cephalic and right middle lobes and the ventral portions of the right cephalic lobe were dark red and hepatised. There were a few large patches of congestion in the caudal lobes. The lung parenchyma was closely beset with grey and translucent tubercles with opaque caseous centres, ranging in size from a mere point up to 4 mm. in diameter, the larger ones being formed by the aggregation of a few small tubercles.

The trachea showed a few congested caseous foci. Some of the smaller bronchi were blocked by yellow purulent material.

Thoracic Glands.—The mediastinal glands were enlarged, firm, and hæmorrhagic, and showed in their cortices about half of the substance replaced by a network of grey nodules with caseous foci.

The bronchial glands were similarly affected.

A gland at the entrance to the thorax was composed practically throughout of pinkish yellow necrotic tissue, the capsule of the gland being thickened.

Heart.—There were two grey tubercles in the heart muscle.

Abdomen.

Omentum.—On the inferior surface of the omentum there were moderately numerous nodules up to a hemp seed in size, some of which were deeply congested, with caseous centres; others were grey and translucent.

Peritoneum.—On the peritoneal surface of the diaphragm there was one flattened grey nodule with a caseous centre.

The rest of the peritoneum was normal.

Spleen.—The spleen weighed 198 grammes. It was normal on the surface; on section it was closely beset with caseating tubercles 2 to 3 mm. in diameter.

Liver.—The surface of the liver was closely beset with grey tubercles with caseous centres, ranging in size from about 0·5 up to 3 and 4 mm. On section similar tubercles were seen throughout the substance.

Gall Bladder.—In the gall-bladder there were five submucous caseous tubercles the size of pin heads.

Portal Glands.—The cortices of the portal glands were closely beset with small irregular greyish yellow caseating tubercles in places forming a close network.

Kidneys.—Each kidney showed in the cortex moderately numerous grey translucent tubercles, the majority having opaque centres ranging in size from a mere point to a millet seed.

Suprarenals.—The left showed one, the right five, small grey tubercles with minute caseous centres.

Iliac, Lumbar, and Renal Glands.—These showed a moderate number of irregular caseous tubercles up to 4 mm. in diameter.

Alimentary Tract.

Tongue.—Normal.

Tonsils.—Each tonsil contained one or two small caseous foci.

There was one flattened nodule on the epiglottis.

Intestines.—The small intestine showed just beneath the mucous membrane a moderate number of small caseous tubercles; these were most numerous towards the ileum. A few of the lymphoid follicles of the large intestine were caseous.

Gastric Glands.—These glands showed a moderate number of yellow caseating tubercles.

Mesenteric Glands.—All the mesenteric glands showed a moderate number of yellow caseating nodules.

Colic and Ileo-colic Glands.—These showed a few small caseous tubercles.

Genito-Urinary System.

Testes.—Normal.

Urinary Bladder.—There were four small tubercles with caseous centres in the bladder.

Various Lymphatic Glands.

Submaxillary, Parotid, and Retro-pharyngeal.—These glands showed a moderate number of discrete caseating tubercles ranging in size from a mere point to that of a millet seed.

Coeliac.—The coeliac glands showed in the cortices a greyish yellow caseous network and a few discrete nodules.

Pudic.—The pudic glands were deeply congested, and contained a moderate number of irregular caseating tubercles.

Precrural, Popliteal, Gluteal, Ischiatic.—Each showed a few discrete caseating tubercles.

Microscopical Examinations.

Suprarenal body, tubercle from.—A few tubercle bacilli seen.

Heart, tubercle from.—No tubercle bacilli seen.

Emulsion of Prescapular Gland.—Numerous tubercle bacilli.

VIRUS P. XXIX.

(December 20, 1905.)

SUBMAXILLARY GLANDS.

Culture Inoculations, January 7, 1907.

The strain was derived from the original material, and had been in cultivation a total period of 383 days.

The culture used was the 12th generation, 24 days old.

CALF 454.

Intravenous.

Dose : 50 mg.
Died : Jan. 23, 1907.
16 days.

P.M.—General Tuberculosis.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
820	Intrav.	0·1 mg.	D. 17 days.	G. T.
824	Intrap.	1·0 mg.	D. 18 „	G. T.
825	Intrap.	0·1 mg.	D. 29 „	G. T.
821	Subcut.	1·0 mg.	D. 75 „	G. T.
822	Subcut.	0·1 mg.	D. 126 „	G. T.
823	Subcut.	0·01 mg.	D. 80 „	G. T.

CALF 454. Virus P. XXIX.

Intravenous inoculation (also partly subcutaneous) of culture derived from original material of Virus P. XXIX.

Dose—50 milligrammes.

Date—January 7, 1907.

Weight at Inoculation—131·98 kilogrammes. [Age about 8½ months.]

Died—January 23, 1907. [16 days after inoculation.]

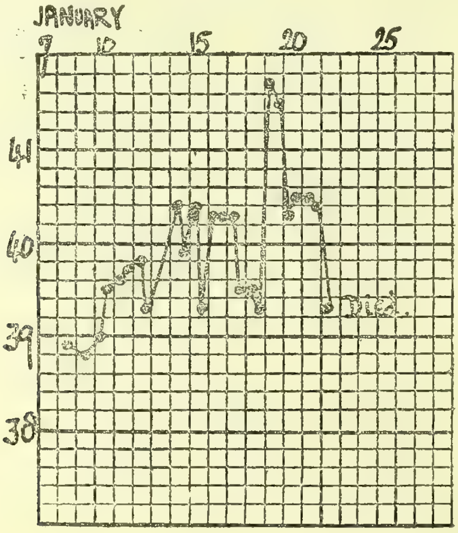
Clinical Notes.

The injection was begun in the vein (median) of the left ear, but owing to the restiveness of the animal the needle came out several times and finally the right ear was used. About 60 milligrammes of culture were used, part of which was lost and part went beneath the skin.

Two days later the calf was noticed to be always lying down ; appetite good. On the third day it was very quiet, was breathing quickly (54 per minute), and panting a little ; its urine was not so abundant. On the tenth day the respirations were laboured (60 per minute) ; the animal's nose was hot, and it lay down a great deal.

On the 14th day it was breathing hard, and looked ill and thin ; two days later the difficulty in breathing had become more evident (70 per minute), and the animal died during the day.

Temperature.



Tuberculin Test.—The calf was not tested subsequent to inoculation.

Weights.

	Kilogrammes.
January 7, 1907	131·98
January 23, 1907	97·04

Total loss of weight during experiment.—34·94 kilogrammes.

POST-MORTEM EXAMINATION.

General Condition.—Very thin.

Local Lesions.—In the subcutaneous tissues of each ear at the seat of inoculation there was a patch of yellowish necrotic substance.

Parotid Lymphatic Glands.—About half of each parotid gland was replaced by greyish early caseous substance which in parts was becoming distinctly yellow.

Thorax.

Lungs.—The lungs weighed 5·78 kilogrammes. They were large and did not collapse normally. There was considerable subpleural emphysema on the dorsal surface of the lungs, but none on the ventral surface. The tongue-shaped lobe of the right lung was reddish grey and almost completely solid ; the free half of it sank in water ; on section it was found to be closely packed with minute irregular grey foci. In the attached half, which floated in water, there were small parts of the lung in which the foci were not quite so numerous. Part of the middle lobe was solid and presented a similar appearance. Similarly the anterior and ventral portions of the left lung were dark, congested, and in parts airless, and on section they presented the same appearance. The rest of the substance of the lungs, that is the greater part, was oedematous but not airless, and was closely filled with minute grey foci varying slightly in number in different lobules.

Bronchial and Mediastinal Glands.—The caudal mediastinal gland was enlarged, measuring 11·5 by 5 by 2·5 cm. The cortex was firm and the outer part closely filled with small irregular grey patches becoming discrete as it extends inwards, so that there was almost a complete thin margin of early caseation.

The next mediastinal gland was firm and congested and showed numerous similar irregular grey patches forming a network. A third gland showed a similar early caseous margin and network. The smaller mediastinal glands were congested and showed grey foci.

The bronchial glands resembled the mediastinal.

Pleura.—Normal.

Heart.—Normal.

The tissues around the heart were very emphysematous, there was also considerable emphysema of the posterior mediastinum.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—The spleen weighed 541 grammes. There was a tendency to become diffluent, otherwise nothing abnormal could be seen.

Liver.—On section of the liver the cut surface showed the interlobular grey network well marked. No tubercles were seen in the organ.

Kidneys.—The kidneys showed on the surfaces alternate pale and congested patches. In the pale areas there were sparsely scattered minute irregular hæmorrhagic foci.

Suprarenal bodies.—Normal.

Renal, Lumbar, and Iliac Glands.—Normal.

Portal Glands.—Normal.

Alimentary Tract.

Tongue, Pharynx, Palate, Tonsils.—Normal.

Intestines—The small intestine was deeply congested in the greater part of its extent. The large intestine was normal.

Mesenteric Glands.—Normal.

Various Lymphatic Glands.

Pharyngeal, Submaxillary, Precrural, Popliteal, Gluteal, Ischiatic, Prescapular, Axillary.—No tubercles seen.

[The glands on the left side of the neck and shoulder were all dark and congested. The tissues between the muscles of the neck showed dilated small vessels—congestion due to hanging of the animal's head during life.]

VIRUS P. XLI.

(May 24, 1906.)

SUBMAXILLARY GLAND.

Culture Inoculations.

I.—November 15, 1906.

The strain was derived from the original material, and had been in cultivation a total period of 175 days.

The culture used was the 8th generation, 21 days old.

FOWL 128.

Intravenous, 15 mg.

Killed : 103 days.

Moderately numerous grey foci in liver. No other tuberculosis.

CALF 478.

Subcutaneous.

Dose : 50 mg.

Killed : Feb. 22, 1907.

99 days.

Fibrous-walled cyst at seat of inoculation. The prescapular gland contained caseo-calcareous nodules ; near it was a small tuberculous nodule. No tuberculosis elsewhere.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1052	Intrav.	1·0 mg.	D. 11 days.	No visible lesions. T.B. in organs.
1051	Intrav.	0·1 mg.	K. 99 „	Slight T. of lungs, kidneys, and left testis.
1054	Intrap.	10·0 mg	K. 99 „	Slight T. of peritoneum, kidneys, lungs, and thoracic glands.
1053	Intrap.	1·0 mg.	D. 23 „	Early G.T.
1056	Subcut.	50·0 mg.	D. 45 „	Large septic local ulcer. Slight T. of lungs.
1055	Subcut.	10·0 mg.	K. 99 „	Local lesion. Slight T. of lungs.

CALF 480.

Subcutaneous.

Dose : 100 mg.

Killed : Feb. 21, 1907.

98 days.

Fibrous-walled cyst at seat of inoculation. In the left prescapular gland were two caseo-calcareous nodules ; the left prepectoral gland showed caseo-calcareous streaks. A few scattered grey tubercles were seen in the liver.

VIRUS P. XLI.

SUBMAXILLARY GLAND

II.—JANUARY 24, 1907.

The strain was derived from the original material, and had been in cultivation a total period of 245 days.

The culture used was the 10th generation, 21 days old.

PIG 172.

Fed.

Dose : 50 mg.
Killed · May 3, 1907.
98 days.

P.M.—Caseous nodules in the submaxillary and mesenteric glands A few grey tubercles in lungs and on diaphragm. One tubercle in the liver and a few in portal glands. No tuberculosis elsewhere.

FOWL 186.

Intraperitoneal.

Dose 100 mg.
Killed : 68 days.

Tuberculous peritonitis only.

PIG 166.

Subcutaneous.

Dose : 50 mg.
Killed : May 7, 1907.
102 days.

P.M.—At seat of inoculation the skin showed healing ulcers. Left inguinal and sternal glands partly caseous. Severe tuberculous consolidation of the lungs. A few nodules in the kidneys ; and one in the spleen.

RABBITS.

Number	Method.	Dose	Duration of Life.	Result.
1212	Intrav.	1·0 mg.	D. 3 days.	No T.
1213	Intrap.	1·0 mg.	D. 40 „	T. of peritoneum. Slight T. of lungs and kidneys Death from other causes.
1214	Subcut.	100·0 mg.	D. 24 „	Local lesion only Death from other causes

CULTURE.

September 20, 1907.

The strain was derived from the lung and had been in cultivation a total period of 136 days.

The culture used was the 7th generation, 20 days old

PIG 202.

Subcutaneous.

Dose : 50 mg.
Died November 23, 1907.
64 days.

P.M.—At seat of inoculation there was a subcutaneous cyst filled with caseopus. Right inguinal and sternal glands caseous. Severe tuberculous consolidation of the lungs. A few tubercles in bronchial and mediastinal glands. A few pale areas in kidneys. No tuberculosis elsewhere

RABBITS.

Number.	Method.	Dose.	Duration of Life	Result.
1481	Intrav	1·0 mg	K 129 days	Slight T. of lungs and kidneys.
1479	Intrav.	0·1 mg	K 129 „	Slight T. of lungs and kidneys
1480	Subcut	50·0 mg.	K. 146 „	Local T. only.
1478	Subcut.	10·0 mg	K 146 „	Local T. only.

Emulsion of Lung.

PIG 228.

Subcutaneous.

Dose . 9·0 cc
Killed : May 7, 1908
166 days.

P.M.—Cyst at seat of inoculation Caseous nodules in the inguinal glands. The lungs showed a few minute translucent foci. A tubercle in a portal gland. No disease elsewhere

CULTURE

March 12, 1908.

The strain was derived from the lung and had been in cultivation a total period of 110 days.

The culture used was the 7th generation, 16 days old.

PIG 258.

Subcutaneous.

Dose . 50 mg
Died June 23, 1908
103 days.

P.M.—Cyst filled with soft caseous substance at the seat of inoculation. Caseation of left inguinal and sternal glands. Lungs solid except for the dorsal surfaces ; partly grey and translucent, partly reddish. Bronchial glands firm (T.B. numerous). A few foci in the kidneys. Various lymphatic glands showed opaque patches.

RABBITS.

Number	Method.	Dose.	Duration of Life.	Result.
1701	Subcut.	50 mg.	K 174 days	Cystic local lesions. Slight T. of lungs and kidneys
1702	Subcut.	50 mg.	K. 174 „	Cystic local lesion. Nodules in nearest glands.

CULTURE.

The strain was derived from the lung and had been in cultivation a total period of 35 days.

The culture used was the 2nd generation, 21 days old

RABBITS.

Number.	Method	Dose.	Duration of Life.	Result.
1861	Intrav.	0·01 mg.	K. 100 days.	Slight T. of lungs and kidneys
1862	Intrav	0·1 mg.	K. 101 „	Slight G T
1863	Intrav	1·0 mg.	D. 27 „	G.T.
1864	Subcut	38 mg.	K. 100 „	Local lesion and slight T. of lungs

CALF 478. Virus P. XLI.

Subcutaneous inoculation of culture derived from the original material of Virus P. XLI.

Dose—50 milligrammes.

Date of Inoculation—November 15, 1906.

Weight at Inoculation—73·48 kilogrammes. [Age about 18 weeks.]

Killed when in good health—February 22, 1907. [99 days after inoculation.]

Clinical Notes.

14 days after inoculation on the left side of the neck there was a prominent tumour firm and adherent to the skin, measuring 12·5 by 9 cm. The left prescapular gland was considerably enlarged, measuring 10 by 5 cm.

Both the tumour and gland slowly diminished in size, and the former became soft and fluctuating; on the 54th day it measured 10 by 6·3 cm. The calf remained well during the experiment.

Temperature.—The temperature rose to 39·9° C. on the 13th day. At the close of the third week it had returned to the normal, and it remained normal subsequently.

Tuberculin Test.—February 19th, 96 days after inoculation. Positive reaction. Rise of temperature, 2·0° C.

Weights.

	Kilogrammes.
November 15, 1906	73·48
February 22, 1907	96·14

Total gain of weight.—22·66 kilogrammes.

Rate of gain per week.—1·62 kilogrammes.

POST-MORTEM EXAMINATION.

General Condition.—Good.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a prominent tumour measuring 14 by 8·3 by 7 cm. and weighing 453 grammes. On section it consisted of a thick fibrous-walled cyst distended with a mucoid caseo-purulent substance.

Left Prescapular Gland.—The left prescapular gland measured 7 by 3 by 1·5 cm. On section it contained a caseo-calcareous nodule 1·5 by 0·75 cm.; two slightly smaller nodules consisting of soft slightly gritty caseous substance; and also, just beneath the capsule, scattered tubercles, some soft and caseous, others caseo-calcareous.

Near the prescapular gland was a small pear-shaped nodule 1·75 cm. in length.

Right Prescapular Gland (6 by 3 cm.).—Normal.

Prepectoral and Axillary Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—Normal.

Thoracic Glands.—Normal.

Heart.—Normal.

Abdomen.

Peritoneum.—Normal.

Spleen (368 grammes).—Normal.

Liver.—The liver contained beneath the capsule and in the substance numerous closely placed irregular grey nodules, the majority with a yellowish tint and many surrounded by congested areas and foci. They varied in size up to roughly 5 mm. in greatest diameter. On section they were soft.

Portal and Coeliac Glands.—Normal

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Renal, Lumbar, and Iliac Glands.—Normal.

Alimentary Tract.

Tongue, Pharynx, Palate, Tonsils.—Normal.

Submaxillary, Pharyngeal, Hyoid, and Parotid Glands.—Normal.

Intestines.—Normal.

Mesenteric Glands.—Normal.

Testes.—Normal.

Eyes.—Normal.

Various Lymphatic Glands.

Precrural, Popliteal, Gluteal, Ischiatic, Pudic.—Normal.

Microscopic Examinations.

Smear from Liver.—No tubercle bacilli.

Emulsion of Liver Tissue.—No tubercle bacilli.

Emulsion of nodule near Prescapular Gland.—Tubercle bacilli in moderate numbers.

CALF 480. Virus P. XLI.

Subcutaneous inoculation of culture derived from the original material of Virus P. XLI.

Dose—100 milligrammes.

Date of Inoculation—November 15, 1906.

Weight at Inoculation—68·90 kilogrammes. [Age about 17 weeks.]

Killed when in good health—February 21, 1907. [98 days after inoculation.]

Clinical Notes.

14 days after inoculation on the left side of the neck there was a prominent rounded tumour, adherent to the skin and infiltrating the subjacent muscles, and measuring 15·3 by 12·5 cm. The dependent tissues were oedematous. The left prescapular gland was not palpable, being overlapped by the tumour.

On the 35th day the tumour measured 10 by 7 cm.; it was soft in the centre and firm round the margins. The prescapular gland was now quite evident, and measured 9 cm. in length.

The tumour afterwards became soft and fluctuating all over, but did not ulcerate. The gland diminished in size until it was no larger than its fellow on the right side.

Temperature.—There was a period of slight pyrexia commencing on the 12th day after inoculation, and lasting a week. The highest temperature recorded during this period was 40·1° C. Subsequently the temperature remained normal.

Tuberculin Test.—February 19, 96 days after inoculation. Slight reaction. Rise of temperature 0·8° C.

Weights.

	Kilogrammes.
November 15, 1906	68·90
February 21, 1907	98·40

Total gain of weight.—29·50 kilogrammes.

Rate of gain per week.—2·10 kilogrammes.

POST-MORTEM EXAMINATION.

General Condition—Good.

Local Lesion.—In the subcutaneous tissues on the left side of the neck there was a tumour measuring 10 by 7·5 by 5 cm. On section it consisted of a cyst filled with turbid fluid in which masses of curdy caseous substance were floating ; it was lined by grey granulation tissue to which flocculi were adherent. It did not infiltrate either skin or muscle.

Left Prescapular Gland.—The left prescapular gland measured 7·5 by 3·5 by 1·3 cm. On section it contained a caseo-calcareous nodule 2·5 by 1·3 cm. and a second the size of a pea ; otherwise the gland was normal.

Prepectoral Glands.—The rounded prepectoral gland on the left side was slightly enlarged and firm, containing a network of translucent tissue with caseo-calcareous streaks. Other prepectoral glands were normal.

Right Prescapular Gland.—Normal.

Axillary Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—Normal.

Thoracic Glands.—Normal.

Heart.—Normal.

Abdomen.

Peritoneum.—Normal.

Spleen.—Normal.

Liver.—On the surface of the liver just beneath the capsule about seven scattered grey slightly irregular tubercles were seen, not larger than a rape seed. On section they were soft and could be picked out. An occasional focus was seen on section in the substance of the liver.

Gall Bladder.—Normal.

Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Renal, Lumbar, Iliac, and Coeliac Glands.—Normal

Alimentary Tract.

Tongue, Pharynx, Palate, Tonsils.—Normal.

Pharyngeal, Submaxillary, Hyoid, and Parotid Glands.—Normal.

Intestines.—Normal.

Mesenteric Glands.—Two showed foci of congestion, otherwise the glands were normal.

Testes.—Normal.

Eyes.—Normal.

Various Lymphatic Glands.

Precrural, Popliteal, Gluteal, Ischiatic, Pudic.—Normal.

Microscopic Examinations.

Liver, Tubercle from.—No tubercle bacilli seen.

Prepectoral Gland, Emulsion of.—No tubercle bacilli seen.

PIG 166. Virus P. XLI.

Subcutaneous inoculation of culture derived from the original material of P. XLI.

Dose—50 milligrammes.

Date of Inoculation—January 25, 1907. [Age 8 weeks.]

Killed when in good health—May 7, 1907. [102 days after inoculation.]

Clinical Notes.

In the subcutaneous tissues 18 days after inoculation there was a rounded prominent soft tumour 6·5 cm. in diameter ; this ulcerated after 84 days and discharged soft caseous substance.

Temperature.—The temperature during the whole of the experiment varied very little, at no time rising above 39·7° C.

Tuberculin Test.—74 days after inoculation. Positive : Rise of temperature 2·7° C.

Weight at Death.—31·29 kilogrammes.

POST-MORTEM EXAMINATION.

General Condition.—Good.

Local Lesion.—At the seat of inoculation to the left of the umbilicus the skin over an area 3·8 cm. square was pigmented and brownish red ; in it there were two small ulcers with thin overhanging margins, from which a little pus could be expressed, and also two pigmented papillæ, which, on section, were fibrous and obviously a consequence of healed ulcers. The skin on the under surface was thickened, fibrous, and pigmented ; there were in the subcutaneous tissues two small sinuses in connection with the ulcers, and scattered soft yellow gritty miliary nodules within grey fibrous capsules.

Left Inguinal Glands.—One left inguinal gland measured 3 by 2 cm. and contained a nodule, replacing nearly half its substance, and consisting of soft yellow caseo-pus, which could be evacuated, leaving a smooth pinkish grey wall ; in the other half of the gland there was a pea-sized nodule similarly constituted, and in the substance between were a few opaque yellowish tubercles. Three other glands were a little firm but otherwise normal.

Right Inguinal Glands.—The glands on the right side were normal.

Left Ventral Mediastinal Gland.—The left ventral mediastinal gland was enlarged, and about half replaced by yellow caseo-purulent substance similar to that in the left inguinal gland.

Precrural Glands.—The precrural glands on both sides were normal.

Thorax.

Pleura.—The lymphatic fringes on the parieta pleura were prominent; along these were moderately numerous flat fibroid nodules, some in the fringes, others loosely attached to the pleura. At the apex of the right pleural cavity there was an area of parietal pleura fairly thickly sown with small hard grey tubercles; the largest were up to a wheat grain in size and several were opaque and yellowish in the centre.

Lungs.—The lungs did not collapse normally. The right posterior lobe showed on the surface, more markedly in the posterior half, numerous raised irregular translucent nodules, varying when discrete up to about 3 mm. in diameter; they extended a little way into the substance. In addition there were similar nodules beneath the pleura not raised from the surface. The two sets were so close together as to form a coarse network of grey nodules. Around the margins of the lobes the nodules had run together, so that the margins were hard and nodular in places nearly 2 cm. in width. On section through the lung substance there were scattered discrete grey miliary tubercles. In the right anterior lobe there was the same distribution of grey nodules on the surface, but also the whole of the right anterior lobe was firm, grey, and solid and sank in water. The middle tongue-shaped piece was about half grey and solid. The left posterior lobe resembled the right, but the nodules were even more closely placed, leaving only small islands of pink lung tissue. The left anterior lobe and the middle tongue-shaped piece were almost entirely grey and solid and sank in water. Nowhere was there any definite caseation, but occasionally there was some slight central opacity in the nodules, and more especially in the discrete tubercles.

The Large Bronchi and the Great Vessels about the Heart were normal.

The Small Bronchi and Bronchioles in the solid grey areas were filled with muco-purulent fluid.

The Bronchial and Dorsal Mediastinal Glands were normal in appearance.

Trachea.—Normal.

Heart.—Normal.

Diaphragm.—The lymphatic fringes on the pleural surface of the diaphragm were prominent, and several of them contained hard flat translucent grey nodules, slightly irregular but roughly the area of a millet seed. On the right side of the peritoneal surface of the diaphragm there were about thirty somewhat flattened translucent nodules, similar to those on the pleural surface; one was a little opaque in the centre. On the left side there were three similar nodules.

Abdomen.

Omentum.—Normal.

Peritoneum.—Normal.

Large and Small Intestines.—Normal.

Mesenteric Glands.—Normal.

Spleen.—In the spleen there was a single yellowish tubercle a little larger than a millet seed, which on section was caseous in the centre.

Liver.—Normal.

Portal Glands.—Normal.

Kidneys.—In the cortices of the kidneys there were moderately numerous discrete grey nodules, yellowish towards the centre. On section they extended a short way through the cortex as a streak; the largest was about the size of a millet seed. A few were met with in the medulla.

Suprarenal Bodies.—In the right suprarenal body there was a firm grey tubercle, opaque in the centre, the size of a rape seed. The left suprarenal body was normal.

The Coeliac, Lumbar, and Iliac Glands were normal.

Alimentary Tract.

Tongue, Tonsils, Larynx, and Pharynx.—Normal.

Various Lymphatic Glands.

Prescapular, Prepectoral, Cervical, Submaxillary, and Parotid Lymphatic Glands were normal.

Microscopical Examinations.

(Smear Preparations.)

Nodule on Diaphragm.—No tubercle bacilli found.

Pneumonic Lung Substance.—Four tubercle bacilli seen.

Muco-pus from Bronchiole.—Three tubercle bacilli seen.

Marginal Nodule from Lung.—A moderate number of tubercle bacilli.

Right Suprarenal Body Nodule.—No tubercle bacilli found.

Right Kidney Nodule.—No tubercle bacilli found.

Bronchial Gland Substance.—Two tubercle bacilli seen.

Animals Inoculated.

Three guinea-pigs inoculated with an emulsion of the muscle remained healthy. Guinea-pigs inoculated with emulsions of the lung, liver, spleen, and kidney became tuberculous.

PIG 172. Virus P. XLI.

Fed once with culture derived from the original material of Virus P. XLI.

Dose—50 milligrammes.

Date of Feeding—January 25th, 1907.

Killed in good health—May 3, 1907. [98 days after feeding.]

Clinical History.

There was no sign of illness during the experiment.

Temperature.—The temperature remained normal throughout.

Tuberculin Test.—74 days after feeding. Positive. Rise of temperature 2·3° C.

Weight at death.—32·19 kilogrammes.

POST-MORTEM EXAMINATION.

General Condition.—Good.

Tongue.—Normal.

Tonsils.—Normal.

Pharynx.—Normal.

Submaxillary Glands.—Left submaxillary glands. Two small glands were normal. A third was enlarged and contained about a dozen discrete nodules up to 3 mm., which easily shelled out of the surrounding gland tissue; they consisted of grey tissue becoming opaque towards the centre where there were whitish slightly gritty streaks and foci.

Right submaxillary glands. One was normal. A second was enlarged and contained about fourteen nodules, similar to those on the other side, up to 5 mm. in diameter.

Pharyngeal Glands.—Normal.

Cervical Glands.—Normal.

Abdomen.

Peritoneum.—Normal.

Omentum.—Normal.

Stomach.—Normal.

Intestines.—Small intestine normal. Large intestine showed the follicles prominent, otherwise normal.

Gastric Glands.—Normal.

Mesenteric Glands.— Almost all the mesenteric glands were beset with irregular waxy caseous nodules with fine opaque white streaks in the centre ; they varied in size up to a small pea, the majority being about the size of a hemp seed ; they shelled out leaving smooth walled cavities in apparently normal gland tissue.

Spleen.—Normal.

Liver.—In the liver just beneath the capsule there was a yellow caseous tubercle within a grey capsule rather larger than a millet seed.

Portal Glands.—In one portal gland there was one opaque spherical tubercle the size of a rape seed ; in a second gland there were five similar tubercles which were soft and not appreciably gritty ; the rest were normal.

Kidneys.—In the cortex of the left kidney there was a pale area with the surface slightly depressed below the normal level and the substance a little firmer than the rest of the kidney.

The right kidney appeared normal.

Suprarenal Bodies.—Normal.

Renal, Lumbar, and Iliac Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—On the surface of the lungs just beneath the pleura there were a few scattered minute translucent tubercles (eight counted), one slightly opaque in the centre ; there were also two rather larger, the size of millet seeds, and perfectly translucent. Section of lungs revealed no more.

Thoracic Glands appeared normal.

Pericardium.—Normal.

Heart.—Normal.

Diaphragm.—On the left side of the diaphragm on the abdominal surface there were about thirty fibroid translucent hard nodules somewhat flattened ; the majority were of the size of millet seeds, but a single large one measured 4 mm. in diameter.

Testes.—Normal.

Prescapular, Prepectoral, Parotid, Cervical, Gluteal, Precrural, Inguinal, and Popliteal Lymphatic Glands appeared normal.

Microscopical Examinations.

(Smear Preparations.)

Lung, Small Tubercle.—No tubercle bacilli seen.

Lung, Large Tubercle.—No tubercle bacilli seen.

Diaphragm (Nodule).—No tubercle bacilli seen.

Follicle of Large Intestine.—No tubercle bacilli seen.

Liver Tubercle.—No tubercle bacilli seen.

Portal Gland Tubercle.—One tubercle bacillus seen.

Animals Inoculated.

Four guinea-pigs from the muscle, and one from the kidney, remained healthy.

Two guinea-pigs from the mesenteric glands became tuberculous.

PIG 202. Virus P. XLI.

Subcutaneous inoculation of culture derived from the lung of Pig 166.

Dose—50 milligrammes.

Date of Inoculation—September 20, 1907. [Age 19·5 weeks.]

Died—November 23, 1907. [64 days after inoculation.]

Temperature.

The temperature remained normal until the fifty-ninth day, five days before death, when it rose slightly, reaching 40·3° C. on the sixty-second day.

Tuberculin Test.

October 29, 1907. 39 days after the experiment began. Dose of tuberculin (Avian) 4·0 cc. Rise of temperature 0·4° C.

Weights.

	Kilogrammes.
September 20, 1907	29·02
November 23, 1907	29·02

POST-MORTEM EXAMINATION.

Local Lesion.—In the subcutaneous tissues on the right side of the abdomen there was a circular tumour 6 cm. in diameter. On section it was found to be a cyst filled with caseo-purulent substance. It was adherent to the muscle in which was a number of discrete soft caseous miliary tubercles.

Inguinal Glands.—One right inguinal gland was enlarged and almost entirely replaced by softening caseous slightly gritty substance. A second gland contained two caseous tubercles.

The left inguinal glands were normal.

Thorax.

Lungs.—The lungs were heavy and did not collapse ; the substance was firm. The anterior lobes were, except for emphysematous margins, reddish grey and airless. On section the solid lung substance was beset with discrete caseous gritty granules. The posterior lobes were extensively consolidated and presented a similar appearance ; the pneumonic tissue was however not continuous, leaving small islands of crepitant lung tissue.

Thoracic Lymphatic Glands.—The bronchial and mediastinal glands contained sparsely-distributed minute opaque caseous tubercles. The right ventral mediastinal gland was enlarged and entirely replaced by softening caseous slightly gritty substance.

Abdomen.

Spleen.—Normal.

Liver.—Normal.

Kidneys.—In the cortices of the kidneys there were some areas slightly paler than the rest of the substance.

There was no tuberculosis of any other organ or gland in the body.

Microscopical Examinations.

(Smear Preparations.)

Lung (grey patch).—A moderate number of tubercle bacilli.

Spleen (substance).—No tubercle bacilli.

Liver (substance).—No tubercle bacilli.

Kidney (substance).—A few tubercle bacilli.

PIG 228. Virus P. XLI.

Subcutaneous inoculation of an emulsion of lung of Pig 202.

Dose—9·0 cubic centimetres.

Date of Inoculation—November 23, 1907. [Age 14·5 weeks.]

Killed when in good general health—May 7, 1908. [166 days after inoculation.]

Temperature.

The temperature remained normal during the experiment.

Tuberculin Test.

January 31, 1908. [69 days after the experiment began.] Dose of tuberculin (Bovine), 2·0 cc. Rise of temperature, 0·7° C.

Weights.

	Kilogrammes.
November 25, 1907	19·95
May 7, 1908	63·49

Total gain in weight.—44·04 kilos.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—In the subcutaneous tissues on the right side of the abdomen there was a tumour about the size of a hen's egg, which on section was a fibrous walled cyst filled with soft caseous substance containing gritty foci.

Inguinal Glands.—One right inguinal gland contained a softening caseo-necrotic nodule 1 cm. in diameter. In the other right inguinal glands there were a few soft caseous tubercles. A left inguinal gland contained a softening caseous nodule 6 mm. in diameter ; the rest were normal.

Thorax.

Lungs.—In the lungs, which were pink and crepitant, there were beneath the pleura scattered minute translucent foci and a few translucent nodules up to a wheat grain in size (parasitic). There was also an occasional grey tubercle with an opaque centre.

Abdomen.

Spleen.—Normal.

Liver.—Normal.

Portal Glands.—In one portal gland there was a minute opaque calcareous tubercle.

There was no tuberculosis elsewhere in the body.

Microscopical Examinations.

(Smear preparations.)

Lung (translucent nodule).—No tubercle bacilli.

Lung (opaque nodule).—No tubercle bacilli.

PIG 258. Virus P. XLI.

Subcutaneous inoculation of culture derived from the lung of Pig 202.

Dose—50 milligrammes.

Date of Inoculation—March 12, 1908. [Age 15·5 weeks.]

Died—June 23, 1908. [103 days after inoculation.]

Clinical History.

The animal did not grow, remaining the same size as when it was inoculated. It was listless and was usually lying down ; its appetite was poor. The breathing was rapid during the last weeks of life.

Temperature.

The temperature reached 40·1° Centigrade on the 23rd day and then quickly fell ; it remained normal until shortly before death. Its highest point (40·6°) was reached 3 days before death.

Weights.

	Kilogrammes.
March 12th, 1908	18·14
June 23rd, 1908	15·42

Total loss in weight.—2·62 kilogrammes.

POST-MORTEM EXAMINATION.

General condition poor.

Local Lesion.—In the subcutaneous tissues of the abdomen to the left of the umbilicus, there was a baggy cyst about the size of a goose's egg ; the skin over it was intact and the tumour could be readily dissected from the under surface. On section it was filled with shreds of necrotic substance and yellow caseo-pus.

Inguinal Glands.—One left inguinal gland the size of a pigeon's egg, and a second half that size, both consisted of thin walled cysts filled with caseo-pus. In two or three smaller glands the centres of the lymphoid follicles were irregular, opaque, and greyish white ; some were a little firmer than the surrounding tissue, others were softer.

The right inguinal glands resembled the small glands on the left side.

Precrural Glands.—The precrural glands were beset with ill-defined opaque, yellowish-white patches.

Thorax.

Lungs.—The convex dorsal surfaces of the posterior lobes were alone air-containing, and just sustained the lungs in water, the anterior and inferior portions of the posterior being quite solid. On section the solid portions of the lungs presented a mottled appearance, the lobules consisting of greyish translucent tissue with occasional soft yellowish foci surrounded by reddish pneumonic lung tissue. In the anterior lobes the greater part was fibroid tissue ; in the posterior the fibroid and pneumonic tissues were about equal. The crepitant portions of the lungs, small in amount, contained discrete nodules similar to those described above.

The lymphatic fringes on the surfaces of the lungs were prominent.

Thoracic Lymphatic Glands.—The bronchial glands were a little firmer than normal, and showed greyish-white streaks and foci.

The left ventral mediastinal gland was enlarged to about the size of a partridge's egg and consisted of a cyst filled with caseo-pus.

Abdomen.

Mesenteric Glands.—The majority of the mesenteric glands were normal in appearance, several showed opaque yellowish foci just beneath the capsules.

Intestines.—Normal.

Spleen.—Normal.

Liver.—The liver was congested, but otherwise normal.

Kidneys.—In the cortices of the kidneys there were scattered minute perfectly translucent foci.

Suprarenal Bodies.—Normal.

Various Lymphatic Glands.—The lumbar, iliac, prescapular, and the majority of the submaxillary glands contained opaque patches consisting of a definite caseous network.

Tonsils.—The tonsils showed a few foci of soft yellowish substance.

Tongue, Larynx, Pharynx, and Trachea.—Normal.

Microscopical Examinations.

(Smear preparations.)

Lung.—Very numerous tubercle bacilli.

Spleen.—Moderately numerous tubercle bacilli.

Inguinal Gland.—Numerous tubercle bacilli.

Bronchial Gland.—Numerous tubercle bacilli.

Lumbar Gland.—A few tubercle bacilli.

Precrural Gland.—A few tubercle bacilli.

Tonsil.—A few tubercle bacilli.

VIRUS P. XLVI.

(July 2, 1906.)

SUBMAXILLARY GLAND.

Culture Inoculations.

I.—November 15, 1906.

The strain was derived from the original material, and had been in cultivation for a total period of 136 days.

The culture used was the 7th generation, 21 days old.

CALF 484.

Subcutaneous.

Dose : 50 mg.

Killed : Feb. 25, 1907.

102 days.

Fibrous - walled cyst filled with caseo-pus at seat of inoculation. In the left prescapular gland was a single caseous and softened nodule. The liver showed some irregular grey foci.

CALF 486.

Subcutaneous.

Dose : 75 mg.

Killed : Feb. 28, 1907.

105 days.

Fibrous-walled cyst at seat of inoculation. The left prescapular gland contained a single fibrocaseous nodule. One prepectoral gland showed a caseo - calcareous nodule. Two bronchial glands contained minute foci.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1045	Intrav.	1·0 mg.	K. 100 days	Slight T. of lungs, kidneys, spleen, and mamma.
1046	Intrav.	0·1 mg.	K. 100 „	Slight T. of lungs, kidneys, spleen, and liver.
1048	Intrap.	10·0 mg.	K. 100 „	Slight T. of peritoneum, kidneys, and lungs. One tubercle in liver.
1047	Intrap.	1·0 mg.	K. 100 „	Slight T. of peritoneum, kidneys, and lungs. One tubercle in spleen.
1050	Subcut.	60·0 mg.	K. 100 „	Local lesion. One tubercle in lung.

II.—January 24, 1907.

The strain was derived from the original material, and had been in cultivation for a total period of 206 days.

The culture used was the 9th generation, 21 days old.

PIG 164.

Subcutaneous.

Dose : 50 mg.

Killed : May 2, 1907.

97 days.

P.M. — Two minute ulcers and caseo-purulent cyst at seat of inoculation. Caseation of left inguinal and sternal glands. Four small tubercles in the lungs. No tuberculosis elsewhere.

PIG 168.

Fed.

Dose : 50 mg.

Killed : March 26, 1907.

60 days.

P.M. — Caseation of submaxillary, mesenteric and colic glands A few translucent tubercles in the lungs. No tuberculosis elsewhere.

CALF 484. Virus P. XLVI.

Subcutaneous inoculation of culture derived from the original material of Virus P. XLVI

Dose—50 milligrammes.

Date of Inoculation—November 15th, 1906.

Weight at Inoculation—48·50 kilogrammes. [Age about 10 weeks.]

Killed when in good health—February 25th, 1907. [102 days after inoculation.]

Clinical Notes.

14 days after inoculation on the left side of the neck there was a pear-shaped tumour measuring 15·2 by 8·3 cm., adherent to skin and to the left prescapular gland, which was enlarged and measured 9 by 4·5 cm.

Subsequently the tumour decreased considerably in size and became soft and fluctuating; the gland also diminished, until on the 75th day it was no larger than the corresponding gland on the opposite side. At this time the tumour was the size of a hen's egg. The calf remained well during the experiment. It was killed on the 102nd day after inoculation.

Temperature. — On the 11th day the temperature rose to 39·6° C., reaching a maximum of 40·4° C. on the 14th day. It then slowly fell to normal, and remained normal during the remaining period of the experiment.

Tuberculin Test.—February 19th, 96 days after inoculation. Positive reaction. Rise of temperature, 1·0° C.

Weights.

	Kilogrammes.
Nov. 15, 1906	48·50
Feb. 25, 1907	64·39

Total gain of weight.—15·89 kilogrammes.

Rate of gain per week.—1·09 kilogramme.

POST-MORTEM EXAMINATION.

General Condition.—Good.

Local Lesion.—The tumour at the seat of inoculation on the left side of the neck measured 7·5 by 5 by 3·5 cm. On section it consisted of a fibrous-walled cyst lined by granulation tissue and filled with caseopus.

Left Prescapular Gland. — The left prescapular gland measured 5·7 by 2 cm. On section it contained a single nodule 1 cm. in diameter, which consisted of soft caseous substance within a thin translucent capsule.

The Right Prescapular Gland, 5·5 cm. in length, was normal.

Prepectoral and Axillary Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—The lungs, except for minute congested foci, appeared normal.

Thoracic Glands.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—Normal.

Liver.—In the liver there were sparsely scattered irregular grey foci.

Gall-Bladder.—Normal.

Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Renal, Lumbar, and Iliac Glands.—Normal.

Alimentary Tract.

Tongue, Pharynx, Palate, Tonsils.—Normal.

Pharyngeal, Submaxillary, Hyoid, and Parotid Glands.—Normal.

Intestines and Mesenteric Glands.—Normal.

Testes.—Normal.

Eyes.—Normal.

Various Lymphatic Glands.

Precrural, Popliteal, Gluteal, Ischiatic, Pudic.—Normal.

Microscopical Examination.

(Smear preparations.)

Foci from Liver. { (1) One tubercle bacillus seen.
(2) No tubercle bacilli seen.

CALF 486. Virus P. XLVI.

Subcutaneous inoculation of culture derived from the original material of Virus P. XLVI.

Dose—75 milligrammes.

Date of Inoculation—November 15th, 1906.

Weight at Inoculation—51·70 kilogrammes. [Age about 12 weeks.]

Killed when in good health—February 28th, 1907. [105 days after inoculation.]

Clinical Notes.

14 days after inoculation on the left side of the neck there was an illdefined local tumour, measuring about 15 by 11·5 cm.; it was prominent at the central part, where it showed a tendency to soften. The left prescapular gland was enlarged, 10 cm. in length.

Subsequently the tumour and gland (like those of Calf 484) decreased considerably in size. On the 75th day the former consisted of a prominent fluctuating bag measuring 9·5 by 5·6 cm.; and the latter was only slightly enlarged. The calf remained well during the experiment.

Temperature.—On the 12th day the temperature rose to 39·7° C., and reached 40·2° C. on the 14th day. By the end of the third week it had regained the normal, and it remained normal until the animal was killed.

Tuberculin Test.—February 19, 1907. 96 days after inoculation. Positive reaction. Rise of temperature, 1·5° C.

Weights.

	Kilogrammes.
November 15, 1906	51·70
February 28, 1907	73·01

Total gain of weight.—21·31 kilogrammes.

Rate of gain per week.—1·42 kilogramme.

POST-MORTEM EXAMINATION.

General Condition.—Good.

Local Lesion.—At the seat of inoculation on the left side of the neck was a somewhat prominent tumour measuring 10 by 7 by 5 cm. On section it consisted of a fibrous-walled cyst containing turbid fluid, with flakes of caseous substance. It did not infiltrate either skin or muscle.

Left Prescapular Gland.—The left prescapular gland measured 5 by 3·7 by 1·5 cm. On section it contained a single fibro-caseous gritty nodule in the cortex measuring 2 by 1 cm.

Right Prescapular Gland.—The right prescapular gland measured 4·5 by 2·2 by 1 cm. It was normal on section.

Prepectoral Glands.—In the round prepectoral gland on the left side there was a nodule composed of caseo-calcareous grains. Other prepectoral glands were normal.

Axillary Glands.—Normal.

Thorax.

Pleura.—On the right side of the pleural cavity there was a small firm adhesion which, on section, was found to be a parasitic cyst.

Lungs.—Normal.

Thoracic Glands.—In two tracheo-bronchial glands there were minute discrete soft opaque foci.

Abdomen.

Peritoneum.—Normal.

Spleen.—Normal, weighed 226 grammes.

Liver.—Normal, except for a parasitic nodule.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Renal, Lumbar, and Iliac Glands.—Normal.

Alimentary Tract.

Tongue, Pharynx, Palate, Tonsils.—Normal.

Pharyngeal, Submaxillary, Hyoid, and Parotid Glands.—Normal.

Intestines.—Normal.

Mesenteric Glands.—Normal.

Testes.—Normal.

Eyes.—Normal.

Various Lymphatic Glands.

Precrural, Popliteal, Gluteal, Ischiatic, Pubic.—Normal.

Microscopical Examination.

Foci from Tracheo-bronchial Gland.—No tubercle bacilli seen.

PIG 164. Virus P. XLVI.

Subcutaneous inoculation of culture derived from the original material of Virus P. XLVI.

Dose—50 milligrammes.

Date of Inoculation—January 25, 1907. [Age 8 weeks.]

Killed when in good health—May 2, 1907. [97 days after inoculation.]

Clinical Notes.

In the subcutaneous tissues, 18 days after inoculation, there was a prominent very soft tumour, which subsequently ulcerated and discharged.

Temperature.—The temperature remained fairly steady during the experiment, the highest temperature recorded being 39·7° C.

Tuberculin Test.—74 days after inoculation. Positive. Rise of temperature 2·4° C.

Weight at death.—28·11 kilogrammes.

POST-MORTEM EXAMINATION.

General Condition.—Good.

Local Lesion.—In the skin at the seat of inoculation to the left of the middle line of the abdomen there was some puckering with signs of previous distension at one part and two minute ulcers. To one side of these, just beneath the skin, which was thinned, there was a small cyst containing caseo-pus. In the subcutaneous tissue and in the muscle there were scattered discrete opaque tubercles, some minute, others up to a hemp seed in size ; they were caseous and gritty and surrounded by grey capsules. There was some cicatricial tissue on the under side of the skin.

Left Inguinal Glands.—One gland was normal. A second gland was enlarged and half filled with caseous gritty tubercles forming a close network. In the rest of the gland there were discrete caseous gritty miliary tubercles and a caseo-necrotic mass which easily shelled out, leaving congested smooth walls.

Right Inguinal Glands.—Normal.

Left Ventral Mediastinal Gland.—In the left ventral mediastinal gland there were numerous tubercles arranged around the cortex ; they were irregular, opaque, and caseous, with gritty centres, and about the size of millet seeds ; they were easily picked out from the gland substance.

Precrural Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—On the surface of each lung there were two perfectly translucent foci, and also two minute opaque yellow calcareous tubercles within grey translucent capsules. There were in the margins a few irregular dark red collapsed patches.

Thoracic Glands.—Normal.

Abdomen.

Omentum.—Normal.

Peritoneum.—Normal.

Spleen.—Normal.

Liver.—Normal.

Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Intestines.—Normal.

Mesenteric Glands.—Normal.

Renal, Lumbar, and Iliac Glands.—Normal.

Tongue, Pharynx, Larynx, Tonsils.—Normal.

Various Lymphatic Glands.

Pharyngeal, Submaxillary, Parotid, Prescapular and Cervical Glands.—Normal.

Popliteal and Gluteal Glands.—Normal.

Microscopical Examinations.

(Smear Preparations.)

Lung Tubercle.—No tubercle bacilli seen; other organisms present.

Left Inguinal Gland.—A few tubercle bacilli seen.

PIG 168. Virus P. XLVI.

Fed once with culture derived from the original material of Virus P. XLVI.

Dose—50 milligrammes.

Date of Feeding—January 25, 1907. [Age 8 weeks.]

Killed—March 26, 1907. [60 days after feeding.]

Clinical History.

No signs of illhealth were noticed during the experiment.

Temperature.—The temperature remained normal throughout.

Tuberculin Test.—The pig was not tested subsequent to feeding.

Weights.—The animal was not weighed before or during the experiment.

POST-MORTEM EXAMINATION.

General Condition.—The pig was in good condition when killed on account of a prolapse of rectum.

Tongue.—Normal.

Tonsils.—Normal.

Pharynx.—Normal.

Submaxillary Glands.—A submaxillary gland on the left side measuring 2 by 1·5 cm. was a little firm and on section was beset with irregular caseous tubercles up to a rape seed in size, which when picked out left a translucent capsule; other small glands were normal.

On the right side there were two submaxillary glands a little firm. One was the same size as, the other smaller than, that on the left; both on section contained similar but rather larger tubercles.

Pharyngeal Glands.—Normal.

Cervical Glands.—Normal.

Abdomen.

Peritoneum.—Normal.

Omentum.—Normal.

Stomach.—Normal.

Intestines.—The small intestine was normal. The large intestine was congested in patches.

Gastric Glands.—Normal.

Mesenteric Glands.—All the mesenteric glands showed moderately numerous irregular discrete waxy caseous nodules similar to but larger than those in the submaxillary glands; some attained nearly the size of a hemp seed. On section they showed streaks slightly more opaque but not appreciably gritty.

Colic Glands.—The majority of the numerous colic glands showed caseous foci.

Spleen.—Normal.

Liver.—Normal.

Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Renal Lymphatic Glands.—Normal.

Coeliac, Iliac, and Lumbar Lymphatic Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—On the surface of the lungs beneath the pleura there were sparsely scattered minute translucent tubercles (6 counted). One showed an opaque centre from which a smear was made.

The Bronchial Glands were normal.

Pericardium.—Normal.

Heart.—Normal.

Various Lymphatic Glands.

Prescapular, Prepectoral, Axillary, Parotid, Precrural, Inguinal, Gluteal, and Popliteal Lymphatic Glands were normal.

Microscopical Examinations.

(Smear Preparations.)

Tubercle from Lung—No tubercle bacilli seen.

Tonsil Secretion.—No tubercle bacilli seen.

Focus from Colic Gland.—No tubercle bacilli seen.

Nodule from Mesenteric Gland.—No tubercle bacilli seen.

IMMUNITY EXPERIMENTS

BY

A. STANLEY GRIFFITH, M.D. AND F. GRIFFITH, M.B.

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IMMUNITY EXPERIMENTS.

INTRODUCTION.

This report gives the results of certain experiments on immunity performed in accordance with the instructions of the Commission.

The object of the experiments was the investigation of the production of immunity in calves by the inoculation of living tubercle bacilli. Sixteen animals were used in the series ; twelve received preliminary vaccinations, ten with bacilli of human origin, and two with bacilli of bovine origin, and were subsequently tested as to their resistance by the subcutaneous inoculation of a large dose (50 milligrammes) of bovine tubercle bacilli ; four were inoculated with 50 milligrammes of bovine tubercle bacilli alone and served as controls.

The human cultures used for the preliminary vaccinations* were obtained from Viruses H 8. "S.C.," H 54. "C.W.," and H 56. "F.T.," and had been shown to be slightly virulent for the calf and rabbit. The resistance-test inoculations and the four control vaccinations were made with a culture derived from the tuberculous bronchial gland of a cow (Virus B XXVI).†

All the animals which had not succumbed were killed three months after the resistance-test inoculation.

DETAILS OF THE EXPERIMENTS AND GENERAL RESULTS.

For the purposes of description the experiments are divided into two sets, one containing the animals which received a single protective inoculation, the other those which received two protective inoculations.

In the first set, two calves, Nos. 1027 and 1017 were inoculated intravenously with 10 milligrammes of a slightly virulent culture (Virus H 8. "S.C") and 63 days later were inoculated subcutaneously with 50 milligrammes of bovine tubercle bacilli.

Calf 1027 died in 46 days of acute tuberculosis ; the lungs were extensively consolidated and beset with nodules ; the thoracic glands were tuberculous ; the liver and kidneys contained scattered miliary tubercles ; there were numerous tubercles on the pleura, and a few on the omentum, and many of the abdominal lymphatic glands contained tubercles.

Calf 1017 was killed, when well, 95 days after the test inoculation ; the lungs contained sparsely scattered calcareous tubercles and there were a few grey foci in the liver and a few gritty points in an omental gland.

Two calves, Nos. 1023 and 1025 were inoculated subcutaneously with 50 milligrammes of the same slightly virulent culture (Virus H 8. "S.C"), and 63 days later subcutaneously with 50 milligrammes of bovine bacilli ; they were killed 92 and 91 days after the test inoculation and showed internally slight tuberculosis of the lungs and thoracic glands, and in one case a single tubercle in a mesenteric gland and one in a colic gland.

Two calves, Nos. 414 and 416 were inoculated subcutaneously with 0·001 milligramme of bovine bacilli (Virus B XXVI.), and 51 days after with 50 milligrammes of the same bovine virus.

No. 414 died in 87 days from some unascertained cause and showed a few tubercles in the thoracic glands and a few in the spleen.

No. 416 was killed 89 days after the last inoculation and showed disseminated tuberculosis, moderately severe and apparently progressing in the thorax, very slight and obviously retrogressive in other organs.

The two controls, Nos. 418 and 422, belonging to this set, died of general progressive tuberculosis in 76 and 44 days respectively.

In the second set, two calves, Nos. 1039 and 1043, were inoculated intravenously with 10 milligrammes of a slightly virulent culture (Virus H 8. "S.C") followed 63 days later by 1·0 milligramme of bovine culture subcutaneously ; 51 days after the last inoculation 50 milligrammes of bovine culture were inoculated subcutaneously.

Calf 1039 was killed, when well, 93 days after the test inoculation and showed very slight tuberculosis of the lung (?), thoracic glands and liver.

Calf 1043 died in 53 days, apparently from diarrhœa ; about a dozen hemp-seed sized caseating nodules were found in the lungs and one dry cheesy nodule in the liver.

Two calves, Nos. 1033 and 1035, were inoculated subcutaneously with 50 milligrammes of a slightly virulent culture (Virus H 8. "S.C"), followed 55 days later by 50 milligrammes of Virus H 56, "F.T" intravenously ; 59 days after the last inoculation 50 milligrammes of bovine culture were inoculated subcutaneously.

Calf 1035 was killed, when well, 91 days after the last inoculation, and showed several nodules in the lung, three tubercles in the spleen, one in the liver, and a few caseous foci in the thoracic glands.

Calf 1033 was killed, when well, 90 days after the last inoculation and only a few small tubercles were found in the lungs.

Two calves, Nos. 923 and 925, were inoculated subcutaneously with 10 milligrammes of Virus H 54. "C.W," followed 181 days later by 50 milligrammes of Virus H 8. "S.C" ; 63 days after the last inoculation 50 milligrammes of bovine tubercle bacilli were inoculated subcutaneously.

These calves were about eleven months old at the time of the test inoculations, and were considerably older than the controls.

Calf 923 died in 36 days ; the lungs were extensively hepatized and closely beset with grey nodules with caseous centres ; the thoracic glands were enlarged and infiltrated with tubercles ; the kidneys showed sparsely scattered grey foci, and the liver, suprarenal bodies, and a few lymphatic glands contained a few small tubercles.

Calf 925 was killed 90 days after the last inoculation, and showed one tubercle in a mediastinal gland and one in the spleen.

Of the two controls belonging to this set, one, No. 476, died in 57 days of general progressive tuberculosis ; the other, No. 474, was killed 92 days after inoculation, and showed general progressive tuberculosis of moderate severity.

All the animals in this set were older at the time of the test inoculation than those in the first set.

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* These preliminary vaccinations were done by Dr. Cobbett.

† *See* Appendix to 2nd Interim Report, Vol. I and Vol. II.

GENERAL SUMMARY.

(*See* Tabular Summary, pages 268–271.)

Controls.—Of the four control calves inoculated subcutaneously with bovine tubercle bacilli, three died in from 44 to 76 days of severe general tuberculosis ; the fourth was killed after 92 days, and showed general progressive tuberculosis.

Vaccinated Animals.—Seven of the twelve vaccinated animals were killed in good health 90 to 95 days after the resistance-test inoculations, and showed for the most part slight and non-progressive lesions of tuberculosis in the internal organs. Two died after 53 and 87 days from some intercurrent disorder, and were also very slightly affected with tuberculosis.

Thus nine out of twelve animals had their resistance so far increased by the protective inoculations that 50 milligrammes of bovine tubercle bacilli were unable to set up in them progressive tuberculosis.

Of the three that remain, one (Calf 416) was killed when well after 89 days and showed general tuberculosis, less severe than that in any of the controls, but more extensive than in the seven just referred to, the lesions in the thorax being apparently progressive. The other two (Calves 923 and 1027) died in 36 and 46 days respectively of acute tuberculosis, differing in some important respects from that produced in the controls ; although the lungs were severely affected there were only few tuberculous lesions visible in the other organs.

The test inoculation of virulent bovine culture in the vaccinated animals was followed in every case by the development within 24 hours of an oedematous swelling (except in calf 923), and a rise of temperature similar to that produced by tuberculin in a tuberculous animal, but of longer duration.

The character of the local lesion produced by the test inoculation in the inoculated animals which survived closely resembled that resulting, after an equal period, from the inoculation of slightly virulent tubercle bacilli in non-vaccinated animals.

These experiments clearly show that by the inoculation of large doses of living human tubercle bacilli, as well as by the inoculation of small doses of bovine tubercle bacilli, the resistance of a calf can be raised sufficiently to protect it against the inoculation of a dose of bovine tubercle bacilli which has been shown to be capable of setting up severe and fatal tuberculosis in a calf not so protected.

They show further that this degree of resistance is not always produced, and that calves which have been vaccinated once, and even twice, with slightly virulent human bacilli, may develop fatal tuberculosis when inoculated with virulent bovine bacilli.

A. Stanley Griffith.

F. Griffith.

TABULAR SUMMARY

No. of Calf.	Age and Weight.	Protective Inoculations.		Duration of Immunization.	Resistance-test Inoculation.				Duration of Life after Resistance-test Inoculation.
		First.	Second.		Virus used.	Method of Inoculation.	Dose.	Date.	
1017	6 weeks. 42·63 kilos.	10 mg. of culture Virus H 8. "S.C." Intravenous. April 3rd, 1906.	—	63 days	B. XXVI.	Subcutaneous.	50 mg.	June 5th, 1906.	95 days. Killed when well.
1027	7 weeks. 42·63 kilos.	Do. do.	—	63 days	Do.	Do.	Do.	Do.	46 days. Died.
1039	9 weeks. 49·89 kilos.	Do. do.	1 mg. of culture Virus B. XXVI. Subcutaneous. June 5th, 1906. [63 days later.]	114 days	Do.	Do.	Do.	July 26th, 1906.	93 days. Killed when well.
1043	11 weeks. 56·24 kilos.	Do. do.	Do. do.	114 days	Do.	Do.	Do.	Do.	53 days. Died.
1023	5 weeks. 38·55 kilos.	50 mg. of culture Virus H 8. "S.C." Subcutaneous. April 3rd, 1906.	—	63 days	Do.	Do.	Do.	June 5th, 1906.	92 days. Killed when well.
1025	9 weeks. 48·05 kilos.	Do. do.	—	63 days	Do.	Do.	Do.	Do.	91 days. Killed when well.
1033	8 weeks. 45·80 kilos.	Do. do.	50 mg. of culture Virus H 56. "F.T." Intravenous. May 28th, 1906. [55 days later.]	114 days	Do.	Do.	Do.	July 26th, 1906.	90 days. Killed when well.
1035	12 weeks. 57·15 kilos.	Do. do.	Do. do.	114 days	Do.	Do.	Do.	Do.	91 days. Killed when well.
923	13 weeks. 61·22 kilos	10 mg. of culture Virus H 54. "C.W." Subcutaneous. October 4th, 1905.	50 mg. of culture Virus H 8. "S.C." Subcutaneous. April 3rd, 1906. [181 days later.]	244 days	Do.	Do.	Do.	June 5th, 1906.	36 days. Died.

Result.
At the site of the resistance-test inoculation there was a fibrous walled cyst containing caseo-purulent masses and serous fluid. The adjacent prescapular gland was closely filled with gritty caseous nodules in a translucent matrix. Two cervical glands were similar ; a third was caseous and softened throughout. In the lungs there were sparsely scattered translucent foci with calcareous centres ; three small caseous gritty tubercles were also seen. The liver contained a few sparsely scattered grey foci. An omental gland showed opaque gritty foci.
At the site of the resistance-test inoculation there was a firm tumour, composed of dense gritty caseo-necrotic substance and thickened and infiltrated skin. The prescapular gland was enlarged and almost entirely caseated. Several cervical glands were more or less advanced in caseation ; a prepectoral gland was beset with caseous foci. The lungs were extensively consolidated and beset with nodules up to a hempseed in size. The thoracic glands were enlarged, their cortex firm, grey, and mottled with yellow foci. There were numerous tubercles on the pleura and a few in the omentum, and sparsely scattered tubercles in the liver and a few in the kidneys. Many of the abdominal lymphatic glands contained each one or more tubercles or tuberculous patches. Tubercles were seen in the iris of both eyes.
At the site of the second protective inoculation there was a small fibro-caseo-calcareous mass and a few similar nodules. The cortex of the adjacent prescapular gland was beset with calcareous grains. At the site of the resistance-test inoculation there was a non-infiltrating caseous tumour, softened in the centre. The right prescapular gland showed caseous gritty streaks and foci in the cortex. Two cervical glands on this side contained tubercles. In the lungs four small tubercles were seen. The mediastinal glands contained an occasional focus. In the liver there was a single caseo-calcareous nodule (3 m.m.).
At the site of the second protective inoculation there was an aggregation of softened caseous nodules. About half the cortex of the left prescapular gland (? slightly enlarged) was beset with caseous gritty tubercles. At the site of the resistance-test inoculation there was an elongated fibro-caseous tumour, cystic in the upper part. The adjacent prescapular gland, slightly enlarged, contained a gritty caseating mass, and caseous streaks and foci. In the lungs there were a dozen yellow caseous nodules about the size of hemp seeds. The thoracic glands were normal. A dry cheesy nodule with a thin fibrous wall was seen in the liver. Other organs and glands were normal.
At the site of the protective inoculation there was a fibrous-walled cyst with caseo-purulent contents. In the right prescapular gland some caseo-calcareous tubercles were seen. At the site of the resistance-test inoculation there was an ulcerated tumour, composed of fibrous tissue with a zone of caseo-calcareous tubercles surrounding a central cavity which communicated with the ulcer by a sinus. The left prescapular gland contained two groups of caseo-calcareous tubercles. The lungs contained sparsely scattered tubercles, translucent, with gritty foci at the centre. All the thoracic glands contained one or more small tuberculous foci.
At the site of the protective inoculation there was a flattened fibro-caseo-calcareous tumour, ulcerated, and containing a central cavity. The prescapular gland contained numerous caseous tubercles in its cortex. At the site of the resistance-test inoculation there was a tumour slightly infiltrating the skin and muscle, composed of fibro-caseous gritty tissue, and ulcerated on the surface. The left prescapular gland was largely composed of similar tissue. Sparsely scattered throughout the lungs were translucent nodules with caseous or caseo-calcareous centres, up to a pea in size. Most of the thoracic glands contained one or more caseous or caseo-calcareous tubercles. One mesenteric and one colic gland, and a Peyer's patch showed each a single caseo-calcareous tubercle. The abdominal organs were normal.
At the site of the first protective inoculation there was a fibrous-walled cyst containing caseo-pus. In the adjacent prescapular gland there were a few caseo-calcareous tubercles and minute caseous foci. At the site of the resistance-test inoculation a tumour of similar character was seen. The left prescapular gland contained a single caseous nodule and some minute caseous foci. The lungs showed about a dozen small grey nodules with minute caseous centres, and about half a dozen small tubercles. Other organs and glands were normal.
At the site of the first protective inoculation there was a cyst containing caseo-purulent slightly gritty substance. At the site of the resistance-test inoculation a cystic tumour of similar character was seen. The adjacent prescapular glands (one slightly enlarged) contained two or three small caseo-calcareous patches and a few caseous foci. The lungs contained scattered nodules, the majority about 1 c.m. in diameter, containing a gritty caseous network or caseous foci. All the thoracic glands showed discrete caseous foci in the cortex. In the spleen there were three tubercles, translucent with gritty caseous centres. The liver showed a single yellow nodule (no T.B. found). Other organs and glands were normal.
At the site of the first protective inoculation there was a small fibro-calcareous lesion. Adjacent to it, at the site of the second, there was a fibrous-walled cyst, with caseo-purulent contents. The prescapular gland on this side showed calcareous nodules. At the site of the resistance-test inoculation there was a soft breaking-down caseous tumour (6 × 5·5 × 2·5 c.m.). The adjacent prescapular gland was enlarged and caseating. The left prepectoral and three left cervical glands contained caseous tubercles or nodules. The lungs were extensively consolidated and beset with grey nodules, slightly caseous in the centre. The thoracic glands were enlarged and infiltrated with tubercles. The liver and kidneys contained sparsely scattered minute tubercles. The spleen was normal. Each suprarenal contained a few tubercles. The portal, iliac, and right precrural glands each contained one or more tubercles.

No. of Calf.	Age and Weight.	Protective Inoculations.		Duration of Immunization.	Resistance-test Inoculation.				Duration of Life after Resistance-test Inoculation.
		First.	Second.		Virus used.	Method of Inoculation.	Dose.	Date.	
925	13 weeks. 62·13 kilos.	10 mg. of culture Virus H. 54. "C.W." Subcutaneous. October 4th, 1905.	40 mg. of culture Virus H. 8. "S.C." Subcutaneous. April 3rd, 1906. [181 days later.]	244 days	B. XXVI.	Subcutaneous.	50 mg.	June 5th, 1906.	90 days. Killed when well.
414	5 weeks. 35·88 kilos.	0·001 mg. of culture Virus B. XXVI. Subcutaneous. June 5th, 1906.	—	51 days	Do.	Do.	Do.	July 26th, 1906.	87 days. Died.
416	5 weeks. 40·36 kilos.	Do. do.	—	51 days	Do.	Do.	Do.	Do.	89 days. Killed when well.
418	4 weeks. 29·03 kilos.	None.			B. XXVI.	Subcutaneous.	50 mg.	June 5th. 1906.	76 days. Died.
422	4 weeks. 34·00 kilos.				Do.	Do.	Do.	Do.	44 days. Died.
474	17 weeks. 73·93 kilos.				Do.	Do.	Do.	July. 26th, 1906.	92 days. Killed when well.
476	19 weeks. 80·73 kilos.				Do.	Do.	Do.	Do.	57 days. Died.

Result.
At the site of the first protective inoculation there was a lesion composed of tough scar tissue with a few calcareous foci in the deeper part. Adjacent to it, at the site of the second, there was a fibrous walled cyst filled with caseo-pus. The right prescapular gland contained one pea-sized calcareous nodule only. At the site of the resistance-test inoculation there was a fibrous-walled tumour with caseo-purulent contents. The left prescapular gland contained two soft caseous nodules and many minute opaque gritty foci. No tubercles were seen in the lungs. One mediastinal gland contained a caseo-calcareous tubercle. In the spleen a single grey nodule with a minute calcareous centre was seen.
The tumour at the site of the protective inoculation was small, firm, and caseo-calcareous. The adjacent prescapular gland was small but extensively caseo-calcareous. The tumour resulting from the resistance test was a cyst filled with caseo-pus. In the adjacent prescapular gland there were numerous caseous gritty tubercles. The lungs were congested but contained no tubercles. Three of the thoracic glands showed one or more caseo-calcareous tubercles. In the spleen there were three tubercles consisting of softened gritty caseous substance in a translucent capsule.
No lesion could be found at the site of the protective inoculation. In the adjacent prescapular gland several pea sized collections of caseo-calcareous tubercles were seen, as well as a few small foci. The prepectoral gland was partly caseo-calcareous. At the site of the resistance-test inoculation there was a fibrous-walled cyst filled with caseo-pus. The adjacent prescapular gland contained small scattered caseous tubercles. The lungs were somewhat voluminous, and showed on the surface and on section numerous congested patches, the majority small, many with caseous foci; the right anterior lobe was consolidated throughout. The thoracic glands were enlarged, firm, and beset with caseo-calcareous nodules. In the spleen a single nodule was found, caseous and gritty, with a translucent margin. In the liver there were two tubercles of similar character. In the cortex of each kidney an occasional grey tubercle was seen. There were a few small caseous gritty tubercles in the portal, renal, and lumbar glands. A precrural and a parotid gland each contained a single tubercle.
General Tuberculosis.
General Tuberculosis.
General progressive Tuberculosis, moderately severe.
General Tuberculosis.

DETAILS OF THE EXPERIMENTS AND FULL POST-MORTEM NOTES OF THE CALVES INOCULATED.

CALF 1017.

Protective Inoculation—April 3, 1906; Intravenous inoculation into the right jugular vein of 10 milligrammes of culture derived from Virus H 8. "S.C." (Mesenteric glands).

Resistance-test Inoculation—June 5, 1906. [63 days after protective inoculation.] Subcutaneous inoculation on the left side of the neck of 50 mg. of culture derived from Virus B XXVI. (Bronchial gland).

Weight at beginning of Experiment—3 qrs. 10 lbs. [Age about 6 weeks.]

Killed when well—September 8, 1906. [158 days after the protective inoculation, and 95 days after the resistance-test inoculation.]

Clinical Notes.

Protective Inoculation.—The temperature rose to 40·0° C. fifteen days after the intravenous inoculation, and remained high for three weeks. After this it was approximately normal. Except for slight constitutional disturbance accompanying the rise of temperature, the calf remained well.

Resistance-test Inoculation.—Six hours after the inoculation the temperature rose to 40·0° C. It remained high for 9 hours, and then slowly fell, becoming normal on the fourth day (*see* chart). The temperature afterwards remained normal.

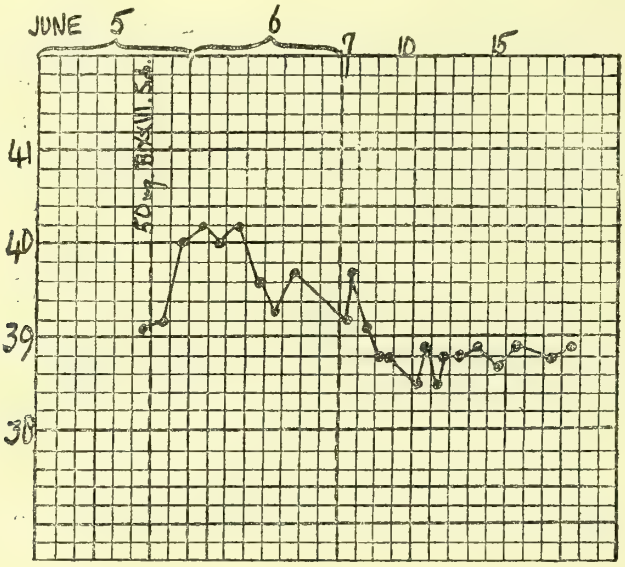
Twenty-four hours after, a tender ill-defined thickening could be felt under the skin, which measured 3 in. by 2 in.; the adjacent prescapular gland was slightly enlarged.

Four days after inoculation the flat subcutaneous thickening measured 4 in. by 2½ in.; on the 14th day the tumour was more prominent and measured 3 in. by 2 in. by about ¾ in. thick; the prescapular gland was about 2½ in. in length.

Two months after the inoculation the tumour was prominent and cystic, measuring 4 in. by 3 in.; the gland was a little over 3 in. in length. On September 8th, 95 days after inoculation, the calf was killed when in good health.

Temperature.

The chart gives the temperature for fourteen days following the resistance-test inoculation.



Each vertical division of the chart under the brackets represents an interval of three hours; elsewhere in the chart each division represents one day.

Weights.

	cwt.	qrs.	lbs.
April 3, 1906	0	3	10
June 25, 1906	1	0	12
September 8, 1906 ...	1	2	4

The calf gained weight steadily during the experiment—2 qrs. 22 lbs. in five months (average rate of gain per week: 3·5 lbs).

POST-MORTEM EXAMINATION.

Condition.—Good.

Resistance-test inoculation.—On the left side of the neck in the subcutaneous tissues there was a rounded projecting tumour measuring 4 in. by 3¼ in. by 2½ in. and weighing with skin and muscle 10 ozs. On section it consisted of a fibrous walled cyst with fibrous trabeculae on the inner walls and was filled with large and small masses of curdy caseo-purulent substance in an almost clear serous fluid.

Left Prescapular Gland.—The left prescapular gland, measuring 3½ in. by 2½ in. by 1½ in. weighed 5 ozs. On section it was closely filled with gritty caseous nodules embedded in a firm translucent matrix. At one side there was a small cavity filled with soft caseo-pus.

Left Prepectoral Glands.—Normal.

Left Axillary Gland.—Norma

Left Cervical Glands.—A left mid-cervical gland was enlarged and closely filled with caseo-calcareous nodules with translucent fibroid margins: a second gland contained a caseous focus. A left inferior cervical gland, the size of a marble, was tense, and on section was filled with soft yellow caseous substance: a second gland showed discrete caseous nodules. Left superior cervical gland, normal.

Right Prescapular, Prepectoral, Axillary, and Cervical Glands were normal.

Thorax.

Pleura.—Normal.

Lungs.—The lungs were crepitant without trace of congestion or collapse. They showed mainly just beneath the pleura sparsely scattered translucent foci with calcareous centres, and also beneath the pleura three tubercles rather larger than a millet seed with soft caseous gritty centres.

Bronchial and Mediastinal Glands.—Normal.

Heart and Pericardium.—Normal.

Abdomen.

Omentum.—In the omentum there was a small gland 4 mm. in diameter containing opaque gritty foci.

Peritoneum.—From the anterior abdominal wall to the stomach there was a long fibrous adhesion.

Intestines.—Normal.

Gastric, Mesenteric, and Colic Glands.—Normal.

Spleen.—Normal.

Liver.—The liver showed a few sparsely scattered minute grey foci not appreciably gritty.

Portal Glands.—The portal glands contained a few congested foci, otherwise normal.

Gall-bladder.—Normal.

Kidneys and Suprarenal Bodies.—Normal.

Renal, Lumbar, and Iliac Glands.—Normal.

Tongue, Larynx, Pharynx, and Tonsils.—Normal.

Special Glands.

The Coeliac, Precrural, Supra-mammary, Gluteal, Popliteal, Ischiatic, Submaxillary, Parotid, and Retropharyngeal Glands were normal.

Microscopical examinations.

(Smear preparations):—

Focus from Liver.—No tubercle bacilli.

Focus from Lung (a)—No tubercle bacilli.

Focus from Lung (b).—A few tubercle bacilli.

CALF 1027.

Protective Inoculation—April 3, 1906; intravenous inoculation into the right jugular vein of 10 milligrammes of culture derived from Virus H 8. "S.C." (Mesenteric glands).

Resistance-test Inoculation—June 5, 1906. [63 days after protective inoculation.] Subcutaneous inoculation on the left side of the neck of 50 mg. of culture derived from Virus B. XXVI. (Bronchial glands).

Weight at beginning of Experiment—3 qrs. 10 lbs. [Age about 6 weeks.]

Died—July 21, 1906. [109 days after the protective inoculation, and 46 days after the resistance-test inoculation.]

Clinical Notes.

Protective Inoculation.—The temperature rose to 40·7° C. on the 18th day, and remained high for nearly three weeks. On the 37th day it fell to 38·8° C., and was very irregular during the following three weeks, the range of variation being 37·7° C.–40·0° C.

The calf suffered from the usual constitutional disturbance during the period of high temperature, but was at no time seriously ill. It was quite well at the time of the resistance-test inoculation.

Resistance-test Inoculation.—Three hours after inoculation the temperature was 39·8° C., 45 hours later it reached 40·7° C., and then slowly fell (*see* chart).

At the site of inoculation a tender oedematous swelling developed which at the end of 24 hours measured 3½ in. in diameter.

On the fourth day the swelling was flatter (and ? firmer) and measured 3 in. by 2½ in. in superficial area.

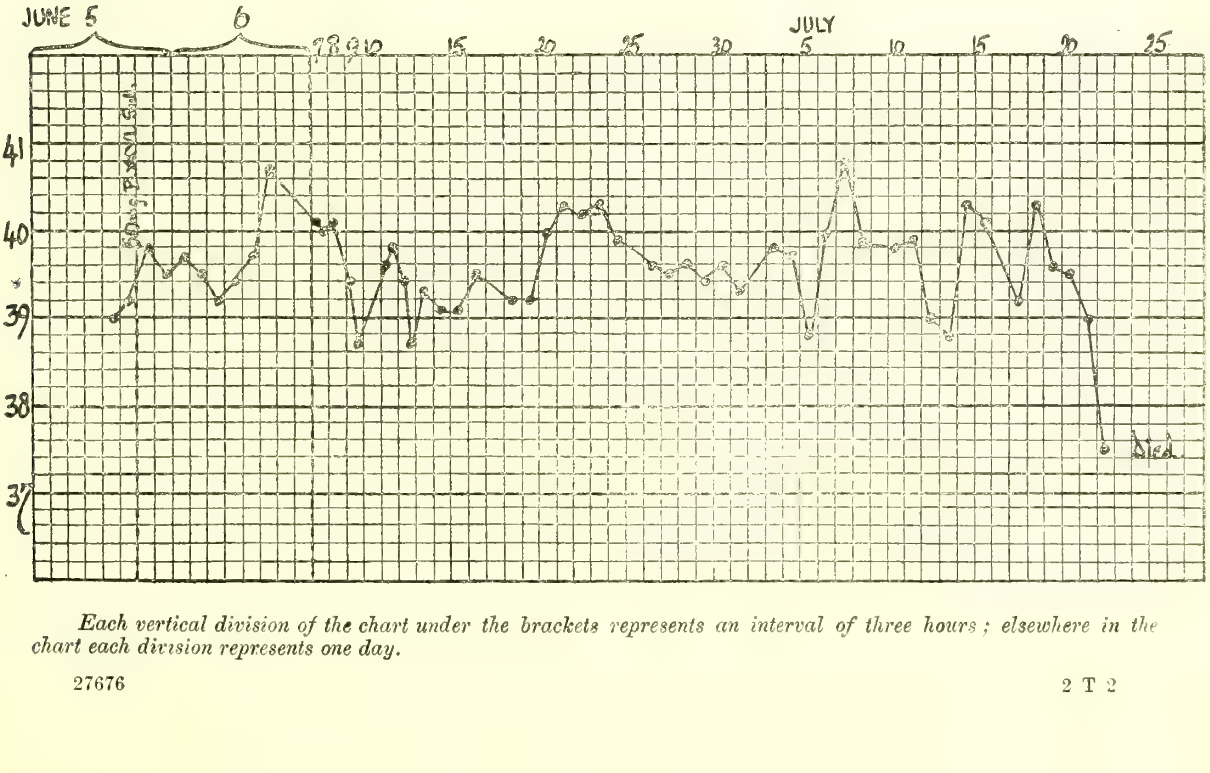
On the 14th day it measured 4 in. by 3½ in., and showed a patch of reddened skin with a dry adherent scab in the centre. The respirations were distinctly increased in frequency, and there was an occasional cough.

On the 21st day the local conditions were unchanged, the respirations were still quicker than normal, and the temperature high (39·6° C.).

On the 31st day the animal was ill; its coat was rough, and it was thinner, though not emaciated, and suffered from photophobia; the temperature was high (40·0 C.). A fortnight later the calf died.

Temperature.

The temperature of the animal subsequent to the resistance-test inoculation is given below.



Each vertical division of the chart under the brackets represents an interval of three hours; elsewhere in the chart each division represents one day.

Weights.

	qrs.	lbs.
April 3, 1906	3	10
June 25, 1906	3	4
July 21, 1906	2	25

Total loss of weight during the experiment—13 lbs.

POST-MORTEM EXAMINATION.

Resistance-test Inoculation.—Local Lesion.—On the left side of the neck there was a firm flat tumour measuring 4½ in. by 3 in. by not quite 1 in. in greatest thickness; on section it was composed of two layers, an external one of greatly thickened skin, showing a yellow caseous infiltration, and a subcutaneous one of very dense pinkish yellow caseo-necrotic substance, containing sparsely scattered yellow calcareous foci, adherent to and slightly infiltrating the muscles.

Left Prescapular Gland.—The left prescapular gland weighed 5 ozs. and measured 3½ in. by 2⅓ in. by 1½ in.; on section the whole of the cortex, with the exception of a small patch which contained discrete caseous nodules, was composed of dense yellow caseated tissue containing sparsely scattered calcareous foci.

Right Prescapular Gland.—Normal.

Prepectoral Glands.—On the left side the spherical prepectoral gland, 1 cm. in diameter, was composed of grey translucent tissue beset with yellow caseous foci; two other glands on this side were enlarged and oedematous but not otherwise abnormal.

The glands on the right side were normal.

Cervical Glands.—On the left side one of the lower cervical glands was enlarged, 1¼ in. in length, indurated and extensively caseated (not so advanced as the prescapular). A gland in the middle of the neck showed caseation around one margin of the cortex. The upper cervical gland showed part of the cortex firm and grey and speckled with yellow caseous foci.

On the right side the cervical glands were normal.

Thorax.

There was a slight excess of fluid in the pleural cavities.

Lungs.—The cephalic, right middle, and antero-ventral portions of the caudal lobes were firm, dark red, and quite airless; the posterior and dorsal portions of the caudal lobes were still air-containing and showed small angular red patches of consolidation.

The lung parenchyma contained moderately numerous firm nodules, ranging in size from a pin's head to that of a hemp seed. The smaller nodules were greyish, with opaque yellowish white centres; the larger ones were yellow, and showed in the centre one or two small calcareous foci. The nodules were not so numerous in the right cephalic and right middle lobes as in the other; on the surface, however, of the right cephalic lobe there was an eruption of yellow caseous tubercles, up to a millet seed in size, and two larger nodules, loosely attached. In the other consolidated lobes the subpleural nodules projected slightly from the surface, and some were "mushroomed."

Thoracic Glands.—The caudal mediastinal gland measured 4 in. in length and was nodular on the surface; on section the cortex was composed of firm grey translucent tissue, mottled with irregular yellow foci and patches of necrosis.

The left bronchial gland was enlarged, and showed the greater part of the margin of the cortex composed of firm grey tissue containing irregular yellow foci; the medulla was very soft.

The right bronchial gland was slightly enlarged and oedematous, and contained sparsely scattered caseous foci up to 1 mm. in diameter.

Other dorsal mediastinal glands were slightly enlarged, and showed in the cortex more or less discrete tubercles with opaque centres.

The ventral mediastinal glands contained a few opaque white foci.

Pleura.—The fringes along the margins of several of the ribs were congested and slightly hypertrophied, and contained clusters of tubercles, varying in size up to that of a hemp seed; the larger ones were opaque and yellow in the centre.

On the pleura covering the pericardium there were numerous firm yellow caseous nodules, occurring chiefly in clusters, the largest the size of a hemp seed; there were several similar clusters of nodules, as well as single ones, on the pleural surface of the diaphragm and the caval fold of pleura.

Abdomen.

Omentum.—The omentum contained three or four tubercles, the largest the size of a millet seed, one deeply congested, none caseous.

Spleen.—The spleen was small, weight 4 ozs.; the capsule was wrinkled and the trabeculae, in places, greatly thickened; no tubercles were seen.

Liver.—The liver showed on the surface under the capsule sparsely scattered grey tubercles, with yellow centres, ranging in size from a pin's head to a little larger than a millet seed; a few of these tubercles were slightly raised and had overhanging margins. On section similar tubercles were sparsely disseminated throughout the substance; some of the larger ones were slightly gritty.

Portal Glands.—The portal glands were not apparently enlarged; each contained a few minute yellow foci and two or three miliary tubercles, opaque and yellow in the centre.

Kidneys.—The left kidney showed in the cortex three or four grey tubercles, the largest 1 mm. in diameter, and one larger tubercle (1·5 mm.) with an opaque yellow centre.

The right kidney contained one yellow tubercle, about twice the size of a millet seed.

Suprarenals.—Normal.

Tongue, Tonsils, Pharynx, Larynx, and Trachea.—Normal.

Intestines.—Normal.

Gastric Glands.—One gastric gland was slightly enlarged and showed the cortex firm and grey and beset with yellow caseous points. Another gastric gland contained a few caseous foci.

Mesenteric Glands.—One contained a hemp seed sized nodule with a yellow centre.

Ileo-Colic and Colic Glands.—One ileo-colic gland showed a small grey patch containing opaque points. Colic glands normal.

Lumbar Glands.—One on the left side contained a hemp seed sized nodule with a yellow gritty centre and grey translucent margin; another contained three opaque miliary tubercles.

Renal Gland.—A renal gland on the left side showed two or three opaque yellow foci.

Various Lymphatic Glands.—The coeliac, pudic, precrural, iliac, ilio-sacral, popliteal, gluteal, ischiatic, axillary, and parotid glands were normal.

Eyes.—In the iris of each eye, arranged chiefly around the periphery, were numerous soft brownish foci which microscopically contained numerous tubercle bacilli; the aqueous humour was cloudy and the lens slightly opaque.

Testicles.—Normal.

CALF 1039.

First Protective Inoculation—April 3, 1906; intravenous inoculation into the right jugular vein of 10 milligrammes of culture derived from Virus H 8, "S.C." (Mesenteric glands).

Second Protective Inoculation—June 5, 1906. [63 days after 1st protective inoculation.] Subcutaneous inoculation on the left side of the neck of 1 mg. of culture derived from Virus B. XXVI. (Bronchial glands.)

Resistance test Inoculation—July 26, 1906. [51 days after 2nd protective inoculation.] Subcutaneous inoculation of 50 mg. of culture derived from the same source, Virus B. XXVI.

Weight at beginning of Experiment—3 qrs. 26 lbs. [Age about 9 weeks.]

Killed when well—October 27, 1906. [207 days after the first protective inoculation and 93 days after the resistance-test inoculation.]

Clinical Notes.

First Protective Inoculation.—The temperature rose on the 9th day, reached 40·7° C. on the 15th day, and and remained high for two weeks; after this it slowly returned to the normal. The calf suffered from the usual constitutional disturbances during the period of high temperature, but was at no time seriously ill. It was quite well at the time of the second protective inoculation.

Second Protective Inoculation.—Twenty-one hours after inoculation the temperature rose to 39·9° C. and nineteen hours later it reached 40·6° C. After this it quickly fell to normal (*see* chart).

Twenty-four hours after inoculation a slight local thickening could be felt, somewhat deeply situated. The prescapular gland was appreciably enlarged.

On the 14th day there was only a slight thickening at the seat of inoculation, and the prescapular gland was normal in size.

The calf had remained well.

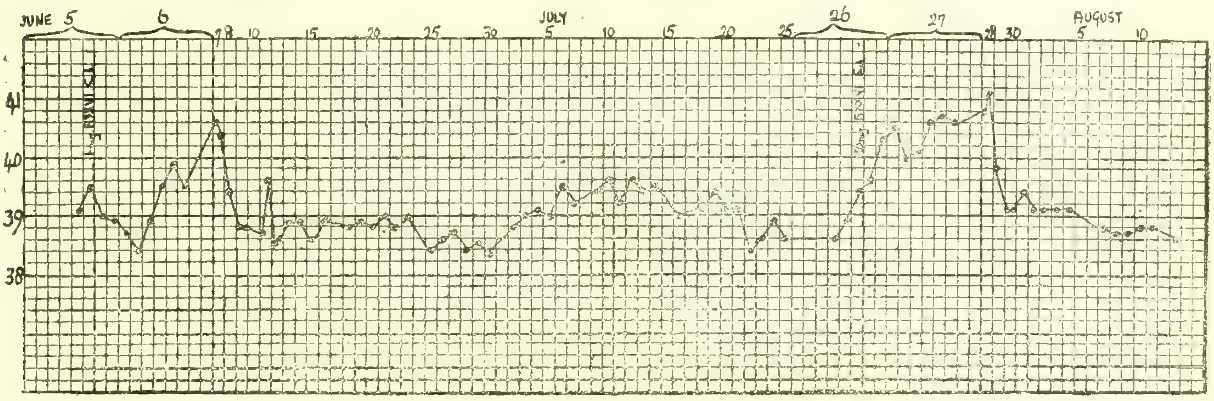
Resistance-test Inoculation.—Six hours after inoculation the temperature rose to 40·3° C. It remained high for 42 hours, reaching a maximum of 41·1° C. After this it rapidly fell to normal (see chart). Twenty-four hours after inoculation a tender slightly raised thickening, 3 in. in diameter, could be felt; the adjacent prescapular gland was slightly enlarged.

Four weeks after inoculation there was a slightly raised irregular firm tumour on the right side, measuring 2½ in. by 1¾ in. This afterwards softened, and decreased in size; seven weeks after inoculation it measured 2 in. by 1¼ in.

Five weeks later the calf was killed when in good health. The temperature had been normal subsequent to the initial rise recorded above.

Temperature.

The temperatures of the animal from June 5 (date of second protective inoculation) to August 13 (18 days after the resistance-test inoculation) are given below. The temperature was normal from August 13 until the calf was killed.



Each vertical division of the chart under the brackets represents an interval of three hours; elsewhere in the chart each division represents one day

Weights.

		cwt.	qrs.	lbs.	
April 3, 1906	...	0	3	26	First protective inoculation.
June 25, 1906	...	1	1	7	
July 26, 1906	...	1	2	1	Resistance-test inoculation.
October 27, 1906	...	1	3	12	Killed.

The calf gained weight steadily during the whole period of the experiment.

Total gain of weight.—3 qrs. 14 lbs.

Average rate of gain per week.—3·3 lbs.

POST MORTEM EXAMINATION.

Condition.—Good.

Second Protective Inoculation.—On the left side of neck in the subcutaneous tissue there was a flattened thickening 2 cm. by 1 cm., which on section consisted of caseo-calcareous substance in a grey fibroid capsule. There were in the tissue around about twelve similar but smaller nodules, ranging in size from a millet seed to a wheat grain.

Left Prescapular Gland.—The left prescapular gland measured 2¾ in. by 1½ in. by ½ in. On section the cortex was beset with irregular calcareous grains confined mainly to the periphery of the gland.

Left Prepectoral, Axillary and Cervical Glands.—Normal.

Resistance-Test Inoculation.—On the right side of the neck in the subcutaneous tissues there was a slightly prominent oval tumour 2 in. by 1½ in. by ¾ in. The tumour infiltrated neither skin nor muscle, and was filled with caseous substance soft in the centre but adherent around the wall.

Right Prescapular Gland.—The right prescapular gland was a little enlarged, measuring 3¼ in. by 1⅝ in. by ½ in. It was firm, and on section the superficial part of the cortex was beset with small irregular gritty caseous streaks and foci.

Right Prepectoral and Axillary Glands.—Normal.

Right Cervical Glands.—The right superior cervical gland showed at one extremity a small collection of irregular caseous foci. A gland in the middle of the neck contained a few scattered caseo-calcareous tubercles up to the size of rape seed. Other right cervical glands were normal.

Thorax.

Pleura.—Normal.

Lungs.—The lungs were pink and crepitant. The right anterior lobe showed on the surface beneath the pleura one translucent miliary tubercle with a calcareous centre. Beneath the pleura of the right posterior lobe there were two tubercles, the larger the size of a hemp seed. The left anterior lobe contained one translucent miliary tubercle. The rest of the lung was normal.

Thoracic Glands. — The bronchial glands were normal.

The mediastinal glands were normal in size; each one showed an occasional irregular opaque focus, some of which were appreciably gritty.

Heart and Pericardium.—Normal.

Abdomen.

Omentum.—The omentum contained a single flat grey nodule 3 mm. in diameter with a caseo-calcareous centre.

Peritoneum.—Normal.

Intestines.—Normal.

Gastric, Mesenteric, and Colic Glands.—Normal.

Spleen.—The spleen, weighing 6 oz., was normal.

Liver.—Just beneath the capsule of the liver on the convex surface there was a caseo-calcareous nodule 3 mm. in diameter, which shelled easily out of a thin translucent capsule. The rest of the liver was normal except for a grey point in the substance.

Portal Glands and Gall Bladder.—Normal.

Kidneys, Suprarenal Bodies, and Renal Lymphatic Glands.—Normal.

Coeliac, Lumbar, and Iliac Glands.—Normal.

Tongue, Pharynx, Larynx, and Tonsils.—Normal.

Special Glands.

Precrural, Gluteal, Popliteal, Ischiatic, Submaxillary, Parotid, and Retro-pharyngeal Glands.—Normal.

Microscopical Examinations.

(Smear preparations) :—

Nodule from Liver.—Three tubercle bacilli seen.

Focus from Mediastinal Gland.—No tubercle bacilli.

CALF 1043.

First Protective Inoculation—April 3, 1906; intravenous inoculation into the right jugular vein of 10 milligrammes of culture derived from Virus H. 8 "S. C." (Mesenteric glands).

Second Protective Inoculation—June 5, 1906. [63 days after first protective inoculation.] Subcutaneous inoculation on the left side of the neck of 1 mg. of culture derived from Virus B. XXVI. (Bronchial glands).

Resistance-test Inoculation—July 26, 1906. [51 days after second protective inoculation.] Subcutaneous inoculation on the right side of the neck of 50 mg. of culture derived from same source, Virus B. XXVI.

Weight at beginning of Experiment—1 cwt. 0 qr. 12 lbs. [Age about 12 weeks.]

Died—September 17, 1906. [167 days after the first protective inoculation, and 53 days after the resistance-test inoculation.]

Clinical Notes.

First Protective Inoculation.—The temperature rose to 40·1° C. fifteen days after the intravenous inoculation; it remained high for a week only, and was afterwards approximately normal. Except for a slight constitutional disturbance accompanying the rise of temperature, the calf remained well.

Second Protective Inoculation.—Forty hours after the inoculation the temperature rose to 39·9° C.; it then rapidly fell to normal (*see* Chart)

Twenty-four hours after inoculation there was a slightly raised tender oedematous swelling 3½ in. in diameter; the adjacent prescapular gland was slightly enlarged.

On the 14th day there was a slight thickening only at the seat of inoculation, and the prescapular gland was about normal in size. The calf was in good health.

The temperature, subsequent to the initial rise recorded above was irregular for ten days, and then remained approximately normal until the resistance-test inoculation.

Resistance-test Inoculation.—Nine hours after inoculation the temperature rose to 39·9° C. It continued to rise, reaching 41·0° C. in forty-two hours. After this it fell; 39° C. was recorded on the fifth day after inoculation (*see* Chart).

Twenty-four hours after the inoculation, a tender ill-defined thickening could be felt, measuring 3 in. by 2 in., and the adjacent prescapular gland was slightly enlarged.

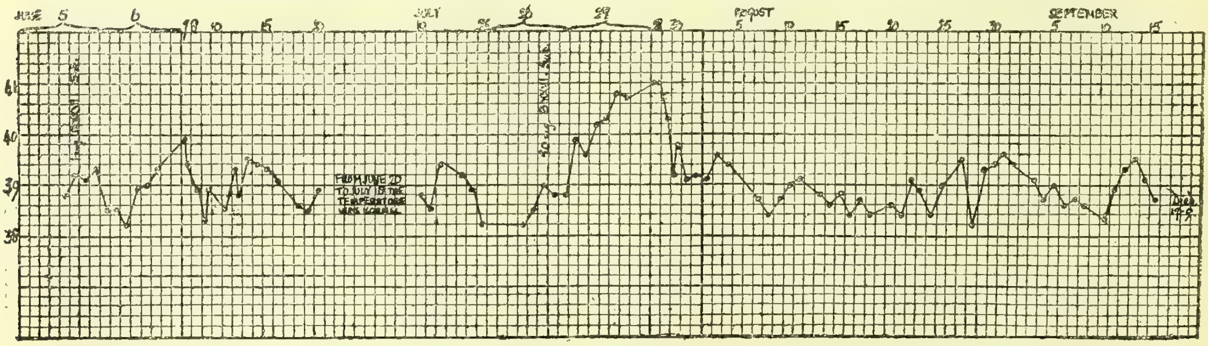
On the 13th day an elongated slightly raised thickening measuring 6 in. by 2¼ in., could be felt at the seat of inoculation, and the prescapular gland was appreciably enlarged.

On the 28th day there was an elongated local tumour, measuring 6 in. by 2¼ in., the upper part prominent and softened, the lower part thin and hard. The right prescapular gland was twice the size of the left. For three weeks the temperature had been approximately normal.

The animal subsequently became very thin and ill, and suffered from diarrhœa; it died 53 days after the resistance-test inoculation. During the last three weeks of life the temperature was irregular, but not high, the maximum being 39·6° C.

Temperature.

The chart gives the temperatures subsequent to the second protective inoculation.



Each vertical division of the chart under the brackets represents an interval of three hours; elsewhere in the chart each division represents one day.

Weights.

		cwt.	qrs.	lbs.	
April 3, 1906	...	1	0	12	First protective inoculation.
June 25, 1906	...	1	1	4	
July 26, 1906	...	1	1	9	Resistance-test inoculation.
September 17, 1906		1	0	0	Died.

During the period covered by the two protective inoculations the calf gained in weight (25 lbs.). After the resistance test inoculation it lost weight considerably (1 qr. 9 lbs. in 53 days).

POST MORTEM EXAMINATION.

Second Protective Inoculation.—On the left side of the neck there was a flat patch, irregular in outline, measuring roughly 2½ in. by 1¼ in. in area, which on section was composed of caseous nodules closely aggregated together, except around the margins of the mass, where they were more or less discrete; the nodules had thin fibrous walls and soft creamy caseous contents. The skin and muscles were adherent but not infiltrated.

Left Prescapular Gland.—The left prescapular gland measured nearly 2 in. in length, by a little over 1 in. in breadth, by ⅓ in. in thickness. On section a little more than half the cortex was beset with caseous gritty tubercles here and there aggregated together to form irregular caseous areas.

Left Prepectoral Gland.—The rounded prepectoral gland on the left side, the size of a large pea, showed around the cortex yellow caseous gritty tubercles, in one part forming a confluent patch.

Left Cervical Glands.—A mid-cervical gland on the left side, slightly oedematous, contained several small caseous foci. Other cervical glands on this side were normal.

Resistance-test Inoculation.—On the right side of the neck there was an elongated tumour measuring 5½ in. by 2 in., and 1¼ in. in greatest thickness; somewhat prominent soft and fluctuating in the upper two-thirds, firm and thinner in the lower one-third. On section the upper portion was a cyst, with turbid fluid contents, and dense fibro-caseous wall $\frac{3}{10}$ in. in greatest thickness, very irregular on its internal surface; the cavity was crossed by fibrous trabeculæ. The lower portion of the tumour was composed of dense fibro-caseous tissue appreciably gritty from calcification.

Right Prescapular Gland.—The right prescapular gland measured 2¼ in. by 1¼ in. by ½ in., and showed on longitudinal section about an inch of the cortex composed of dense caseating slightly gritty tissue; the rest of the cortex, except at one extremity, which was normal in appearance, was beset with yellow foci and streaks of caseation, many just perceptibly gritty.

Right Prepectoral Gland.—The rounded prepectoral gland on the right side, the size of a large pea, showed on section a number of minute caseous points. Other prepectoral glands on this side were normal.

Right Cervical Glands.—An upper cervical gland on the right side showed at one extremity a group of caseous foci. A superior cervical gland also showed a group of caseous foci at one extremity. The rest were normal.

Axillary glands, left and right, normal.

Thorax.

Pleura.—Normal.

Lungs.—The lungs were pinkish, crepitant, and collapsed normally. The left lung showed on the surface under the pleura about half-a-dozen yellow caseous nodules with grey margins, the largest rather larger than a hempseed. In the right lung there were about the same number of nodules, none larger than a millet seed. On section of the lung one tubercle was found in the left caudal lobe, none elsewhere.

Bronchial and Mediastinal Glands.—Normal.

Heart.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—The spleen was smaller than normal. The pulp was atrophied, the fibrous trabeculæ being more conspicuous than normal.

Liver.—The liver was pale, and showed on the anterior surface under the capsule an irregular yellow nodule a little larger than a hempseed; on section the nodule had a thin fibrous wall and dry, cheesy, gritty contents. The liver was otherwise normal.

Portal Glands.—Normal.

Kidneys and suprarenal bodies.—Normal.

Coeliac, Lumbar, Ilio-Sacral, Iliac, Precrural, and *Pudic glands.*—Normal.

Alimentary Tract.

Tongue, Pharynx, Palate, Tonsils, Larynx.—Normal.

Pharyngeal, Submaxillary, and *Parotid Glands.*—Normal.

Intestines.—Normal.

Mesenteric and *Colic Glands.*—Normal.

Testes.—Normal.

Eyes.—Normal.

CALF 1023.

Protective Inoculation—April 3, 1906; Subcutaneous inoculation on the right side of the neck of 50 milligrammes of culture derived from Virus H. 8 " S. C." (Mesenteric glands).

Resistance-test Inoculation—June 5, 1906. [63 days after protective inoculation.] Subcutaneous inoculation on the left side of the neck of 50 milligrammes of culture derived from Virus B, XXVI. (Bronchial glands).

Weight at beginning of Experiment—3 qrs. 1 lb. (Age about 5 weeks.)

Killed when well—September 6, 1906. [155 days after the protective inoculation, and 92 days after the resistance-test inoculation.]

Clinical Notes.

Protective Inoculation.—A small tumour of the usual non-infiltrating type developed at the seat of inoculation, and the adjacent prescapular gland became slightly enlarged.

The temperature was irregular during seven weeks, but at no time was it much above the normal, the highest temperature recorded being 39·6° C.

Two months after inoculation the local tumour was the size of a pigeon's egg, prominent and softened; extending downwards from it was a narrow elongated thickening 5 in. in length. The calf remained in good health.

Resistance-test inoculation.—Six hours after inoculation the temperature rose to 40·0° C., and reached a maximum of 40·7° C. 24 hours after inoculation. After this it slowly fell, becoming normal on the 8th day (*see* Chart).

Twenty-four hours after inoculation an elongated oedematous swelling could be felt. The adjacent prescapular gland was not enlarged.

On the 4th day there was a small firm local swelling about 1½ in. in diameter, with an oedematous band extending from it into the tissues of the neck. The prescapular gland was slightly enlarged.

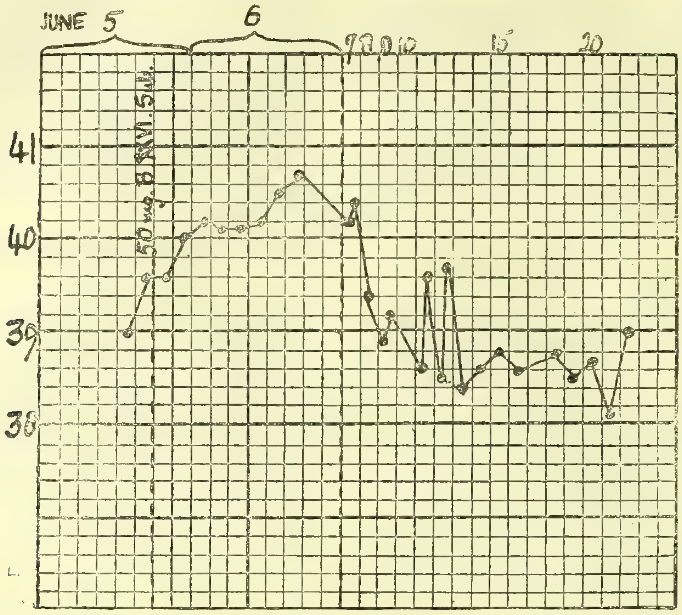
On the 21st day the swelling was oval, about the size of a bantam's egg; the gland was still slightly enlarged.

The swelling subsequently diminished in size; on the 64th day it was only ½ in. in diameter.

The calf remained well; it was killed 92 days after the resistance-test inoculation. The temperature, subsequent to the initial rise recorded above, had remained approximately normal.

Temperature.

The chart gives the temperature for 17 days subsequent to the resistance-test inoculation.



Each vertical division of the chart under the brackets represents an interval of three hours; elsewhere in the chart each division represents one day.

Weights.

		cwt.	qrs.	lbs.	
April 3, 1906	...	0	3	1	Protective inoculation.
June 25, 1906	...	0	3	15	
September 5, 1906		1	0	3	Killed.

The calf gained 30 lbs. in weight during the experiment; the average rate of gain per week was 1·4 lbs.

POST-MORTEM EXAMINATION.

Condition.—Good.

Protective Inoculation.—On the right side of the neck in the subcutaneous tissues there was an irregularly shaped tumour consisting of a rounded prominent portion about the size of a pigeon's egg connected with a deeper sausage-shaped swelling 2¾ in. in length. It was adherent to skin and muscle without infiltration. On section it consisted of a cyst with fibrous walls containing caseo-purulent slightly gritty substance; the inner wall was roughened by strands of fibrous tissue.

Right Prescapular gland.—The right prescapular gland measured 2 in. by ¾ in. by ¼ in. On section it contained two small patches of caseo-calcareous tubercles up to a millet seed in size and an occasional discrete tubercle.

The right Prepectoral and Axillary glands were normal.

Right Cervical glands.—The right superior cervical gland was normal. Of two small glands in the middle of the right side of the neck one contained a single tubercle, the other several caseous gritty tubercles up to a millet seed in size. In the right inferior cervical gland there were a few yellow calcareous grains.

Resistance-test Inoculation.—On the left side of the neck in the subcutaneous tissues there was a flattened roughly circular tumour 1¼ in. in diameter. In the skin over it there was an ulcer ½ in. in length communicating with a small cavity in the tumour. The tumour consisted of fibrous tissue with caseo-calcareous tubercles just around the cavity.

Left Prescapular Gland.—The left prescapular gland measured 2½ in. by 1¼ in. by ½ in. On section it contained two small nodules at one extremity composed of collections of caseo-calcareous tubercles.

Left Prepectoral Glands.—The left round prepectoral gland showed caseo-calcareous tubercles around the cortex, collected into a small nodule at one part. Left reniform prepectoral gland normal.

Left Axillary Gland.—Normal.

Left Cervical Glands.—The left superior cervical gland had about half its substance replaced by caseo-calcareous tubercles. Two left middle cervical glands contained a few discrete caseo-calcareous tubercles the size of rape seed. An inferior cervical gland showed similar caseo-calcareous tubercles replacing a third of the gland.

Thorax.

Pleura.—Normal.

Lungs.—The lungs collapsed normally and were soft and crepitant. The left lung showed on the surface sparsely scattered translucent tubercles varying from 1 to 4 mm. in diameter, which contained in the centre either a single or several yellow gritty foci. On section of the lung a few could be seen in the substance, but the majority were superficial. The right lung showed similar scattered nodules.

Thoracic Glands.—In each of two left bronchial glands there was a single yellow gritty focus.

In the right supra-bronchial gland there were a few very minute opaque foci and a single caseous tubercle in the small gland at the root.

In the long mediastinal gland there were sparsely scattered tubercles, varying from an opaque focus up to a rape seed in size. There were a few minute opaque foci in the other mediastinal glands.

Heart, Pericardium and Diaphragm.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Stomach and Intestines.—Normal.

Gastric, Mesenteric, and Colic Glands.—Normal.

Spleen, Liver, Gall-bladder and Portal Glands.—Normal.

Kidneys, Suprarenal Bodies and Renal Glands.—Normal.

Lumbar and Iliac Glands.—Normal.

Tongue, Pharynx, Larynx, Tonsils and Trachea.—Normal.

Various Lymphatic Glands.

The Precrural, Pudic, Gluteal, Popliteal, Ischiatic, Submaxillary, Parotid and Retro-pharyngeal Glands were normal.

Microscopical Examination.

(Smear preparation):—

Tubercle from Mediastinal Gland.—No tubercle bacilli.

CALF 1025.

Protective Inoculation—April 3, 1906; subcutaneous inoculation on the right side of the neck of 50 milligrammes of culture derived from Virus H 8 "S.C." (Mesenteric glands).

Resistance-test Inoculation—June 5, 1906. [63 days after protective inoculation.] Subcutaneous inoculation on the left side of the neck of 50 milligrammes of culture derived from Virus B. XXV. (Bronchial glands).

Weight at beginning of Experiment—3 qrs. 22 lbs. [Age about 8 weeks.]

Killed when well—September 4, 1906. [154 days after the protective inoculation, and 91 days after the resistance-test inoculation.]

Clinical Notes.

Protective Inoculation.—A small tumour of the usual non-infiltrating type developed at the seat of inoculation, and the adjacent prescapular gland became slightly enlarged.

The calf remained well, and there was no rise of temperature following the inoculation.

Resistance-test Inoculation.—Six hours after inoculation the temperature rose to 40·1°C., and reached a maximum of 40·9°C. 42 hours later.

On the fourth day it had fallen to normal, 39·0°C. (*See* chart.)

Twenty-four hours after inoculation an elongated oedematous swelling could be felt extending into the tissues of the neck, 3 in. in length, firmer above than below; the left prescapular gland was slightly enlarged.

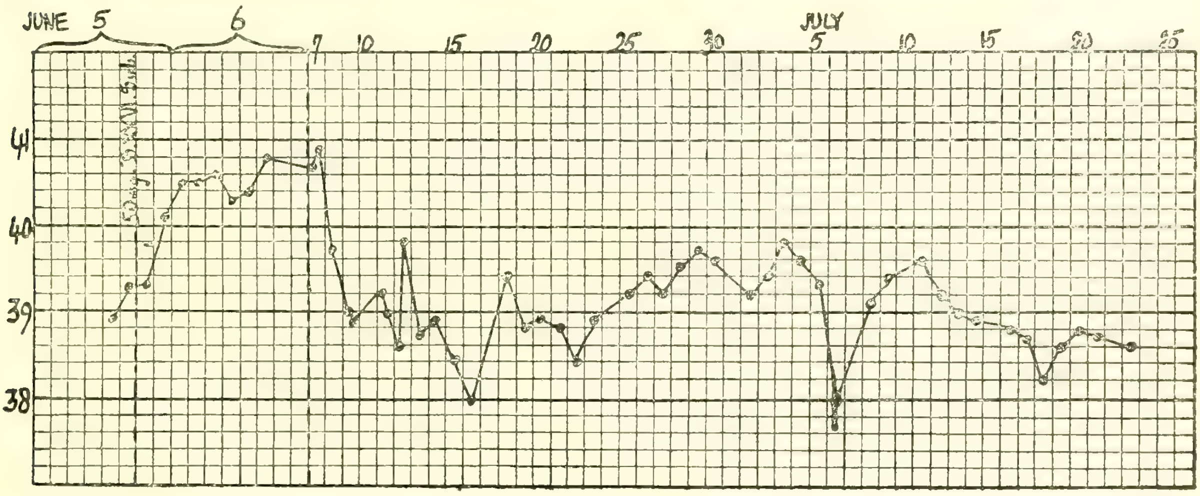
On the fourth day there was a flat subcutaneous thickening at the seat of inoculation, 4 by 3 in., slightly oedematous below. The prescapular gland was 2 in. in length.

On the 21st day the local thickening measured 4 by 2¼ in., and the skin over it showed a dry ulcer. The calf was in good health; the temperature was, however, raised a little above normal, 39·4°C.

On the 64th day there was a slightly raised elongated swelling at the seat of inoculation, 6 in. by 3 in., with an irregular ulcer in the upper part 1½ in. in greatest length. The prescapular gland was enlarged, 3½ in. long. The calf was in good health, the temperature normal. During the rest of the experiment the local conditions and the general health of the animal remained unchanged, and on the 91st day after the resistance-test inoculation the calf was killed

Temperature.

The temperature of the calf for 48 days subsequent to the resistance-test inoculation is given below. From July 22 until the calf was killed the temperature was normal.



Each vertical division of the chart under the brackets represents an interval of three hours; elsewhere in the chart each division represents one day.

Weights.

		cwt.	qrs.	lbs.	
April 3, 1906	...	0	3	22	Protective inoculation.
June 25, 1906	...	1	1	7	
September 4, 1906	...	1	2	24	Killed.

The calf gained 3 qrs. 2 lbs. in weight during the experiment; the average rate of gain per week was therefore 4 lbs.

POST-MORTEM EXAMINATION.

Condition.—Good.

Protective Inoculation.—On the right side of the neck in the subcutaneous tissues there was a flattened tumour 1½ in. by ½ in. with a central constriction. On section one half contained a small cavity filled with caseo-pus, while the other half and the central constricted portion were composed of fibrous tissue containing scattered caseo-calcareous foci and a softened caseous nodule.

Right Prescapular Gland.—The right prescapular gland measured 2¼ in. by 1 in. by ½ in. The greater part of the cortex, viewed from the outside, was closely filled with irregular caseous tubercles. On section these were softened and slightly gritty, and, with the exception of a pea-sized nodule in the deeper part, were confined to the periphery of the gland.

Right Prepectoral and Cervical Glands.—Normal.

Right Axillary Gland.—Normal.

Resistance-test Inoculation.—On the left side of the neck in the subcutaneous tissues there was a somewhat flattened, roughly pear-shaped tumour measuring 7 in. by 3 in. by 1½ in. and weighing with skin and muscle 12 ozs. In the skin there was an oval depressed ulcer 1½ in. by 1 in. with undermined edges. On section the tumour was composed of fibro-caseous, gritty tissue, adherent to both skin and muscle, and containing a central cavity the walls of which were partly lined by pinkish granulation tissue and partly honeycombed by translucent bands stretching across them. There was some infiltration of the skin round the margins of the ulcer and slight extension into the muscle in the form of caseous foci.

Left Prescapular Gland.—The left prescapular gland weighed 4 ozs. and measured 4½ in. by 2 in. by 1½ in. On section the greater part of the gland was replaced by firm fibro-caseous gritty tissue with scattered hæmorrhagic foci. There was a small part of the medulla unaffected and part of the cortex with more or less discrete caseo-calcareous tubercles.

Left Prepectoral Glands.—The left round prepectoral was slightly enlarged. The left reniform prepectoral gland contained one minute caseous focus in which tubercle bacilli were demonstrated.

Left Axillary Gland.—Normal.

Left Cervical Glands.—The left superior cervical gland was enlarged and diffusely caseo-calcareous throughout.

Thorax.

Pleura.—Normal.

Lungs.—On the surface beneath the pleura of the left cephalic lobe there were seven translucent nodules up to 2·5 mm. in diameter with yellow caseo-calcareous centres. The left caudal lobe showed scattered nodules varying in size from a millet seed up to a pea; the smallest were translucent for the most part with calcareous centres, while the largest contained a fine caseous network, appreciably gritty.

On the surface of the right lung beneath the pleura there were scattered nodules similar to but more numerous than those on the left, varying from 5 to 8 mm. in diameter. Between the right anterior and middle lobes where the surfaces were in contact there were twelve loosely attached growths up to 8 mm. in diameter composed of translucent tissue with yellow caseating centres.

On section of both lungs there were similar nodules sparsely scattered throughout the substance.

Thoracic Glands.—The right supra-bronchial gland contained scattered yellow caseous nodules up to 2 mm. In the left bronchial gland there were a few yellow gritty tubercles up to a millet-seed in size. The infra-bronchial glands showed single caseous tubercles. The glands about the trachea and one within the bifurcation were normal.

The long mediastinal gland contained a few caseo-calcareous tubercles up to a hemp-seed. In a second mediastinal gland there was a caseous miliary tubercle and a caseous focus in a third.

Heart and Pericardium.—Normal.

Diaphragm.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Stomach and Gastric Glands.—Normal.

Intestines.—In a Peyer's patch in the ileum there was a translucent nodule the size of a wheat grain with a yellow gritty centre. The intestines were otherwise normal.

Mesenteric Glands.—In an anterior mesenteric gland there was a single caseo-calcareous tubercle the size of a rape-seed. There was a similar tubercle in a colic gland. The rest were normal.

Spleen.—The spleen (10 ozs.) was normal.

The Liver and Portal Glands were normal.

The Kidneys, Suprarenal Bodies, and Renal Lymphatic Glands were normal.

Urinary Bladder and Testicles.—Normal.

Special Lymphatic Glands.

The Coeliac, Lumbar, and Iliac Glands were normal.

The Precrural, Gluteal, Popliteal, Ischiatic, Submaxillary, Parotid, Retro-pharyngeal, and Haemo-lymph Glands were normal.

Microscopical Examinations.

(Smear preparations):—

Mesenteric Gland.—One tubercle bacillus.

Left reniform Prepectoral Gland.—Two tubercle bacilli.

Intestine (Nodule from Ileum).—No tubercle bacilli.

Colic Gland.—No tubercle bacilli.

CALF 1033.

First Protective Inoculation—April 3, 1906; subcutaneous inoculation on the right side of the neck of 50 milligrammes of culture derived from Virus H. 8. "S.C." (Mesenteric glands).

Second Protective Inoculation—May 28, 1906. [55 days later]. Intravenous inoculation into the left jugular vein of 50 milligrammes of culture derived from Virus H. 56. "F.T." (lung) through G.P. 1682.

Resistance-test Inoculation—July 26, 1906. [59 days after 2nd protective inoculation]. Subcutaneous inoculation on the left side of the neck of 50 milligrammes of culture derived from Virus B. XXVI. (Bronchial gland).

Weight at beginning of Experiment—3 qrs. 17 lbs. [Age about 8 weeks.]

Killed when well—October 24, 1906. [204 days after the first protective inoculation, and 90 days after the resistance-test inoculation.]

Clinical Notes.

First Protective Inoculation.—A small tumour of the usual non-infiltrating type developed at the seat of inoculation, and the adjacent prescapular gland became slightly enlarged.

The calf remained well, and there was no rise of temperature following the inoculation.

Second Protective Inoculation.—The temperature rose to 40·3°C. within 24 hours of the intravenous inoculation, and remained high for three days (*see* chart). It was afterwards normal. The calf remained in good health, apart from a transient constitutional disturbance accompanying the rise of temperature.

Resistance-test Inoculation.—Nine hours after inoculation the temperature rose to 39·9°C., and reached a maximum (40·5°C.) twenty-one hours after inoculation. After this it slowly returned to the normal (*see* chart).

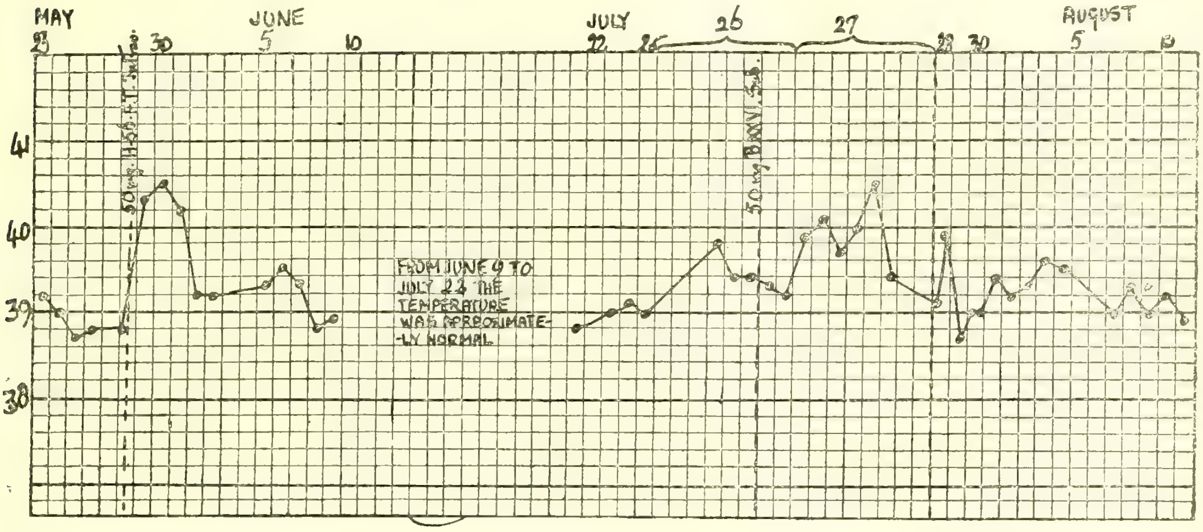
Twenty-four hours after the inoculation a slightly raised local thickening could be felt, measuring 3 in. by 1½ in., and the left prescapular gland was slightly enlarged.

On the 13th day there was a slightly raised local tumour measuring 3 in. by 1½ in., and the prescapular gland was slightly enlarged.

On the 28th day the tumour was cystic, measuring 2½ in. by 1¾ in., by about 1 in. thickness, and the gland was only very slightly enlarged. The calf was in good health, and the temperature normal (38·7°C.). No important change took place subsequently in the local conditions, and the calf remained well; it was killed 90 days after the resistance-test inoculation. After the initial rise recorded above, the temperature remained approximately normal until the animal was killed, the maximum range of variation being 38·3°C.–39·6°C.

Temperature

The temperatures immediately subsequent to the second protective and the resistance-test inoculations are given on the chart.



Each vertical division of the chart under the brackets represents an interval of three hours; elsewhere in the chart each division represents one day.

Weights.

	cwt.	qrs.	lbs.	
April 3, 1906 ...	0	3	17	First protective inoculation.
May 28, 1906 ...	1	1	3	Second protective inoculation.
July 26, 1906 ...	1	2	6	Resistance-test inoculation.
October 24, 1906	2	1	4	Killed.

The calf gained weight steadily during the entire period of the experiment, the total gain being 1 cwt. 1 qr. 15 lbs. [Average rate of gain per week, 5·3 lbs.]

POST-MORTEM EXAMINATION.

Condition.—Good.

First Protective Inoculation.—On the right side of neck in the subcutaneous tissue there was a rounded prominent tumour about the size of a pheasant's egg. This on section consisted of a smooth-walled fibrous cyst containing caseo-pus.

Right Prescapular Gland.—The right prescapular gland measured 2¼ in. by 1 in. by ¼ in. On section the cortex was a little firm showing minute petechial hæmorrhages. There were a few caseo-calcareous tubercles the size of pin heads and an occasional minute caseous focus.

The Right Prepectoral, Axillary and Cervical Glands.—Normal.

Resistance-test Inoculation.—On the left side of the neck in the subcutaneous tissues there was an oval prominent tumour measuring 2½ in. by 1¾ in. by 1¼ in. On section it consisted of a cyst with fibrous walls, lined internally by a thin layer of translucent tissue, and containing a mucoid caseo-purulent substance. The walls internally were crossed by tissue trabeculae, dividing them into loculae.

Left Prescapular Gland.—The left prescapular gland measured 2¼ in. by 1 in. by ⅓ in. On section it contained at one extremity an irregular caseous nodule 1 cm. in diameter, and discrete minute caseous foci in part of the cortex. The rest of the gland, about one-third, was quite normal.

Left Prepectoral Gland.—A left prepectoral gland contained a few caseo-calcareous grains.

Left Cervical Gland.—The left inferior cervical gland showed at one extremity a slightly firm patch containing discrete minute irregular caseous foci.

Left Axillary Gland.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—The lungs were pink in colour and crepitant. The right anterior lobe was normal; the tongue-shaped piece contained one pinhead translucent tubercle. The middle lobe was normal. The right caudal lobe showed five pinkish grey nodules up to a wheat grain in size, and two rather larger nodules with minute central caseous foci. The left anterior lobe contained four grey nodules not larger than a wheat grain which had in the centre minute caseous foci and a zone of congestion around. In the left caudal lobe there were six grey tubercles not larger than a millet seed.

Bronchial and Mediastinal Glands.—Normal.

Heart and Pericardium.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Stomach and Intestines.—Normal.

Gastric, Mesenteric, and Colic Glands.—Normal.

Spleen, Liver, and Portal Glands.—Normal.

Kidneys, Suprarenal Bodies and Renal lymphatic Glands.—Normal.

Various Lymphatic Glands.—Lumbar, iliac, coeliac, precrural, pudic, gluteal, popliteal, submaxillary, parotid, and retropharyngeal glands: Normal.

CALF 1035.

First Protective Inoculation—April 3, 1906; Subcutaneous inoculation on the right side of the neck of 50 milligrammes of culture derived from Virus H 8 "S.C." (Mesenteric glands).

Second Protective Inoculation—May 28, 1906. [55 days later.] Intravenous inoculation into the left jugular vein of 50 mg. of culture derived from Virus H 56 "F.T." (lung) through G.P. 1682.

Resistance-test Inoculation—July 26, 1906. [59 days after second protective inoculation]. Subcutaneous inoculation on the left side of the neck of 50 mg. of culture derived from Virus B. XXVI. (Bronchial glands).

Weight at beginning of Experiment—1 cwt. 0 qr. 14 lbs. [Age about 12 weeks.]

Killed when well—October 25, 1906. [205 days after the first protective inoculation and 91 days after the resistance-test inoculation.]

Clinical Notes.

First Protective Inoculation.—A small tumour of the usual non-infiltrating type developed at the seat of inoculation, and the right prescapular gland became slightly enlarged. The calf remained well, and there was no rise of temperature.

Second Protective Inoculation.—The temperature rose to 41·4°C. within 24 hours of the intravenous inoculation (*see* chart). It slowly fell, and afterwards remained normal. The calf remained well, except for slight constitutional disturbance accompanying the rise of temperature.

Resistance-test Inoculation.—Nine hours after inoculation the temperature rose to 40·0°C. and reached a maximum—40·5°C.—forty hours after inoculation. It then rapidly fell to normal (see chart).

Twenty-four hours after the inoculation, an ill-defined tender thickening could be felt, measuring 3 in. by 2 in. The adjacent prescapular gland was slightly enlarged.

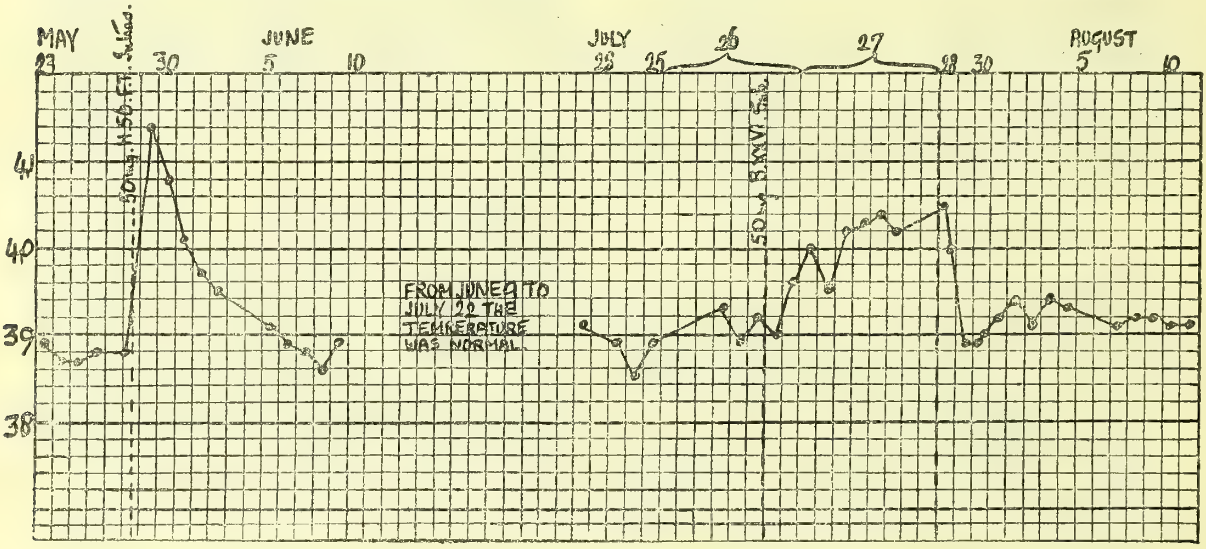
On the 13th day there was a slight thickening at the seat of inoculation, 3 in. by 1½ in.; the prescapular gland was slightly enlarged.

On the 28th day the local conditions were unchanged; the calf was in good health, and the temperature normal.

On the 50th day there was a softened swelling at the seat of inoculation, 2½ in. by 1½ in.; the prescapular gland was 2 in. long. The calf remained well, and the temperature normal, and on the 91st day after the resistance-test inoculation, the animal was killed.

Temperature.

The temperatures immediately following the second protective and resistance-test inoculations are given in the chart. From August 12 to October 25, when the calf was killed, the temperature was approximately normal.



Each vertical division of the chart under the brackets represents an interval of three hours; elsewhere in the chart each division represents one day.

Weights.

	cwt.	qrs.	lbs.	
April 3, 1906 ...	1	0	14	First protective inoculation.
May 28, 1906 ...	1	2	6	Second protective inoculation.
July 26, 1906 ...	1	3	17	Resistance - test inoculation.
October 25th, 1906 ...	2	1	19	Killed.

The calf gained weight steadily during the entire period of the experiment, the total gain being 1 cwt. 1 qr. 5 lbs. [Average rate of gain per week, 5 lbs.]

POST-MORTEM EXAMINATION.

Condition.—Good.

First Protective Inoculation.—On the right side of the neck in the subcutaneous tissue there was a rounded prominent tumour about the size of a pheasant's egg, not infiltrating either skin or muscle. On section it was a cyst with almost smooth walls internally containing a caseo-purulent slightly gritty substance.

Right Prescapular Gland.—The right prescapular gland measured 2 in. by 1 in. by ¼ in. On section there were in the superficial part of the cortex two patches of caseous gritty tubercles up to the size of a millet seed. The rest of the gland except for an occasional caseous focus beneath the capsule was normal.

The Right Prepectoral, Axillary and Cervical Glands were normal.

Resistance-Test Inoculation.—On the left side of the neck in the subcutaneous tissues there was a pear-shaped swelling measuring 3¾ in. by 1¾ in. by 1 in. Although adherent to skin and muscle it did not infiltrate and could be readily dissected away; in the muscle were three isolated caseous tubercles. On section the tumour consisted of a thin walled fibrous cyst, which was lined internally by translucent tissue beset with soft caseous streaks and contained caseopus.

Left Prescapular Gland.—The left prescapular gland, 2½ in. by 1¼ in. by ⅓ in., contained on section in the cortex three patches measuring from 1 c.m. to 1·5 c.m. composed of closely aggregated gritty caseous streaks and foci. Parts of the gland were quite normal; the rest showed sparsely scattered irregular caseous foci.

Left Prepectoral Glands.—The left prepectoral glands were normal.

Left Axillary Gland.—Normal.

Left Cervical Glands.—The left inferior cervical gland, 2 c.m. in diameter, contained a firm grey nodule with a caseous gritty network replacing half the gland. Of the other half the margin of the cortex was caseated. In the midcervical region there was a gland a little firm and partly filled with a caseous network.

Thorax.

Pleura normal.

Lungs.—The lungs were pink and crepitant and contained scattered nodules, the majority about one centimetre in diameter, occurring both on the surface and in the substance. They were irregular in outline and corresponded with a lobule or part of a lobule. Some were reddish in colour, others grey with reddish margins.

On section the more advanced nodules consisted of grey tissue with a caseous gritty network in the centre and a margin of consolidated lung tissue around. The smaller nodules were made up of pinkish grey tissue with caseous foci.

Thoracic glands.—The caudal mediastinal gland measured 4½ in. in length and 1 in. at its widest part. The cortex was a little firm and contained in the superficial part discrete yellow caseous sometimes gritty foci.

The other mediastinal glands were a little enlarged and firm, and showed in the cortices discrete caseous foci with occasionally an indication of the formation of a fine caseous network.

The bronchial glands were similar to the mediastinal glands, those on the right showing more numerous caseous foci.

Pericardium, Heart, and Diaphragm.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Stomach and Intestines.—Normal.

Gastric, Mesenteric, and Colic Glands.—Normal.

Spleen.—The spleen weighed 7 oz. In the substance were three tubercles, two the size of millet seeds and one the size of a hemp-seed. They were easily picked out, and consisted of firm translucent tissue with caseous gritty centres.

Liver.—In the centre of the liver in the fibrous capsule of a portal system there was a yellow gritty nodule in a thin translucent capsule the size of a wheat grain.

Portal Glands.—Normal.

Kidneys, Suprarenal Bodies, and Renal lymphatic Glands.—Normal.

Lumbar and Iliac Glands.—Normal.

Tongue, Pharynx, Larynx, and Tonsils.—Normal.

Various Lymphatic Glands.

Precrural, Gluteal, Popliteal, Pudic, Parotid, Submaxillary, Retro-Pharyngeal, and Ventral Mediastinal Glands.—Normal.

Microscopical Examination.

(Smear preparation.)

Nodule from liver.—No tubercle bacilli.

CALF 923.

First Protective Inoculation—October 4, 1905; subcutaneous inoculation on the right side of the neck of 10 milligrammes of culture derived from Virus H 54 "C.W." (Spleen) through G.P. 1609.

Second Protective Inoculation—April 3, 1906. [181 days after 1st protective inoculation.] Subcutaneous inoculation on the right side of the neck of 50 mg. of culture derived from Virus H 8 "S.C." (Mesenteric glands).

Resistance-test Inoculation—June 5, 1906. [63 days after 2nd protective inoculation.] Subcutaneous inoculation on the left side of the neck of 50 mg. of culture derived from Virus B XXVI. (Bronchial glands).

Weight at commencement of Experiment—1 cwt. 0 qrs. 23 lbs. [Age about 13 weeks.]

Died—July 11, 1906. [280 days after the first protective inoculation, and 36 days after the resistance-test inoculation.

Clinical Notes.

First Protective Inoculation.—A small fluctuating tumour of the usual non-infiltrating type developed at the seat of inoculation, and the prescapular gland became slightly enlarged. The temperature rose to 40·0°C. on the 7th day, and remained high for three weeks; it was afterwards normal. The calf was quite well.

Second Protective Inoculation.—A tumour developed at the seat of inoculation of similar character to the first. The temperature was a little irregular during the fortnight following the injection, but was afterwards quite normal. The general health of the animal was unaffected.

Resistance-test Inoculation.—Twelve hours after the inoculation the temperature rose to 40·0°C. It continued to rise, and reached a maximum—40·9°C.—48 hours after inoculation (*see* chart).

Twenty-four hours after inoculation a slight local thickening only could be felt.

On the fourth day there was a small raised thickening 1¾ in. in diameter and the prescapular gland was slightly enlarged.

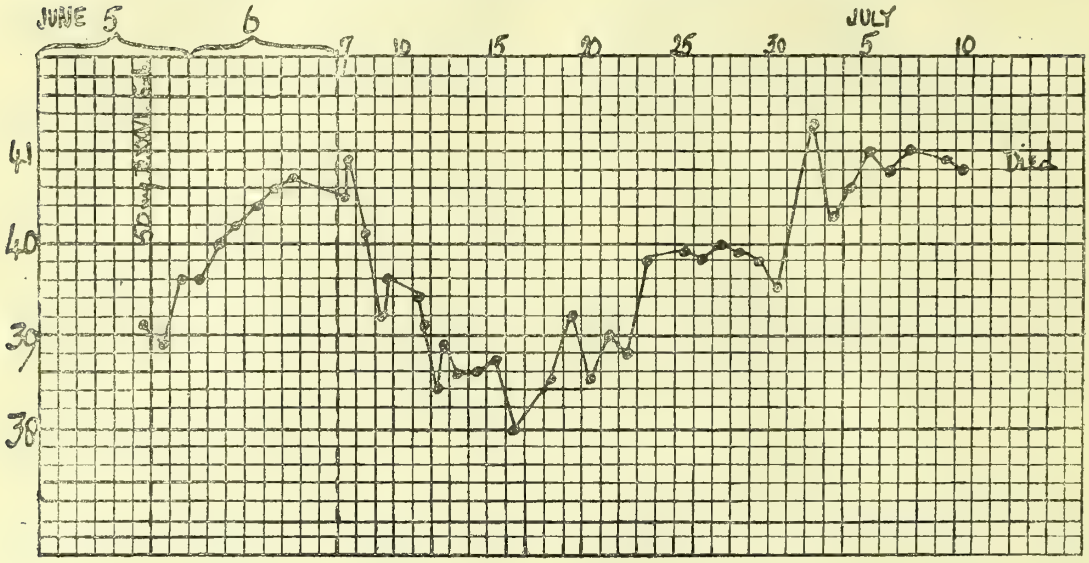
On the 14th day after inoculation the swelling was firm, prominent, and pearshaped, measuring 3 in. by 2 in. The prescapular gland was enlarged, 3 in. in length. A week later the swelling was soft and fluctuating throughout.

On the 27th day the temperature rose to 41·3°C., and on the next morning the respirations were noticed to be increased in frequency; the rate of respiration continued frequent, and on the 31st day the animal was obviously ill, standing with arched back and roughened coat.

On the 35th day the rate of respiration was 132 per minute; the head was extended, the mouth open, and the lips and alæ nasi opened widely during inspiration. The temperature was very high, 40·8°C. The following day the calf died.

Temperature.

The temperatures following the resistance-test inoculation are shown below :—



Each vertical division of the chart under the brackets represents an interval of three hours ; elsewhere in the chart each division represents one day.

Weights.

	cwt.	qrs.	lbs.
October 4, 1905	1	0	23
April 3, 1906	2	2	26
June 25, 1906	3	1	0
July 11, 1906	2	2	15

The calf increased in weight during the first 8½ months, gaining 2 cwt. 0 qrs. 5 lbs. From June 25 to July 11, 1906, it lost 2 qrs. 13 lbs.

Tuberculin Test.— March 30, 1906. 146 days after 1st protective inoculation. Reacted. Rise of temperature 1·4°C.

POST MORTEM EXAMINATION.

Carcass.—Emaciated.

Protective Inoculations.—In the subcutaneous tissues no the right side of the neck there was a cyst about the size of a pigeon's egg, with thin fibrous wall, lined internally with granulation tissue and caseo-purulent contents.

In the subcutaneous tissues a few inches posterior to the above there was a small fibrous nodule, brownish and translucent in the centre and beset with yellow calcareous particles, denser and whiter around the margins.

Resistance-test Inoculation.—On the left side of the neck there was a soft fluctuating swelling, somewhat pear-shaped in outline, measuring 2½ in. by 2¼ in. by 1 in. ; on section it was composed of a series of communicating cavities, filled with soft yellow caseo-pus ; around the cavities there was a layer of reddish firm tissue, nowhere very thick, containing yellow streaks and foci of necrosis ; the internal surface of each cavity was covered with a thin yellow adherent membrane.

Right Prescapular Gland.—The right prescapular gland measured 2¼ in. by ¾ in. by ½ in., and showed in the cortex about half-a-dozen calcareous nodules, the largest the size of a hempseed, composed of aggregations of calcareous particles set in a soft brownish translucent matrix.

Left Prescapular Gland.—The left prescapular gland measured 3¼ in. by 2 in. by 1 in. ; on section part of the cortex was composed of translucent slightly congested fibroid tissue containing ramifying tracks and irregular patches of caseo-necrotic substance, in many places softened and breaking down ; the rest of the cortex, except at one extremity, where it was normal, was deeply congested and closely beset with yellow caseous miliary tubercles.

Prepectoral Glands.—One on the left side, the size of a broad bean, was œdematous and showed in the centre a moderate number of discrete yellow caseous tubercles, the largest 1 mm. in diameter, with deeply congested margins. Other prepectoral glands were normal.

Cervical Glands.—A lower cervical gland on the left side was closely beset with tubercles similar to those in the prepectoral gland. A gland in the middle of the neck on this side, the size of a pheasant's egg, showed the greater part of the substance dense yellow and caseous ; the rest was greyish red and closely studded with caseous foci. A small gland just in front of the latter contained numerous small congested yellow tubercles. The left upper cervical glands and all the cervical glands on the right side of the neck were normal.

Thorax.

Lungs.—The lungs did not collapse, and almost completely filled the chest ; they were heavy, and weighed with attached glands 20 lbs. 6 ozs.

The cephalic lobes, the right middle lobe and a large portion (antero-ventral) of each caudal lobe were firm, dark red, and quite airless ; they were studded on the surface with slightly raised greyish nodules, the largest the size of a hempseed ; on section these solid portions were found to be closely beset with grey nodules, irregular in outline, ranging in size from a mere point up to that of a hempseed (2 mm. or rather more in diameter) ; the larger nodules were speckled with minute yellow points, the smaller ones had minute opaque yellow centres. The nodules remained for the most part discrete, but had here and there coalesced. The posterior and dorsal portions of the caudal lobes were still air containing and showed commencing interstitial emphysema ; they contained nodules similar to those in the consolidated lobes, but not so numerous.

Thoracic Glands.—The tissues around the dorsal mediastinal glands were very emphysematous.

The mediastinal and bronchial glands were enlarged, and together weighed 9½ ozs. ; the caudal mediastinal gland measured 5 in. by 2 in. by about 1 in.

On section the mediastinal glands showed their cortices firm and greyish, as if infiltrated with confluent grey tubercles, and the medullary portions deeply congested ; scattered about in the cortices were yellow caseous miliary tubercles. The right bronchial gland resembled the mediastinal glands. The cortex of the left bronchial gland was less uniformly grey and showed discrete grey nodules and patches containing caseous foci ; the medulla was soft and almost diffluent.

Pleura.—There was slight hypertrophy of the fringes along the margins of the ribs and on the diaphragm, but no tubercles could be felt.

Heart.—The pericardial sac contained a slight excess of fluid. The epicardium showed a few patches of reddish velvety vegetation. The heart muscle and valves were normal. The cavities were filled with red blood clot.

Larnyx and Trachea.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—Weight 1 lb. 6 ozs. No tubercles were seen on the surface or on section; the pulp was dark red and moderately firm, and the Malpighian bodies could not be differentiated.

Liver.—The liver was normal in general appearance; it showed throughout the substance very sparsely scattered minute opaque spherical tubercles.

Portal Glands.—One contained three or four greyish white foci, not calcareous; two others contained each one caseous focus.

Kidneys.—Both kidneys showed on the surface sparsely scattered greyish translucent foci, the largest not quite 1 mm. in diameter; similar foci were seen on section.

Suprarenal Bodies.—The left suprarenal body showed in the cortex four miliary tubercles with yellow caseous centres and grey margins; there were a few similar tubercles in the right suprarenal.

Alimentary Tract.

Tonsils, Pharynx.—Normal.

Submaxilliary, Retro-pharyngeal, and Parotid Glands were deeply congested, but did not contain tubercles.

Intestines.—Normal.

Gastric, Mesenteric, and Colic Glands.—Normal.

Various Lymphatic Glands.

The Right Precrural Gland showed in the cortex a yellow caseous focus.

The Left Precrural, Pudic, Cœliac, Lumbar, Sacro-iliac, and Gluteal Glands were normal.

The Left Iliac Gland showed two or three yellow foci in the cortex; there was one yellow point in the cortex of the right iliac gland.

CALF 925.

First Protective Inoculation—October 4, 1905. Subcutaneous inoculation on the right side of the neck of 10 milligrammes of culture derived from Virus H 54 "C.W." [Spleen] through G.P. 1609.

Second Protective Inoculation—April 3, 1906. [181 days after first protective inoculation.] Subcutaneous inoculation on the right side of the neck of 40 mg. of culture derived from Virus H 8 "S.C." (Mesenteric glands).

Resistance-test Inoculation—June 5, 1906. [63 days after second protective inoculation.] Subcutaneous inoculation on the left side of the neck of 50 mg. of culture derived from Virus B. XXVI. (Bronchial glands).

Weight at beginning of Experiment—1 cwt. 0 qr. 25 lbs. [Age about 13 weeks.]

Killed when well—September 3, 1906. [334 days after the first protective inoculation, and 90 days after the resistance-test inoculation.]

Clinical Notes.

First Protective Inoculation.—A small tumour of the usual non-infiltrating type developed at the seat of inoculation and the prescapular gland became slightly enlarged. The temperature rose to 40·0°C. on the tenth day, and remained high for eleven days. After this it was normal. The general health of the calf was unaffected.

Second Protective Inoculation.—This inoculation was made on the same side of the neck as the first, and a tumour developed similar in character to it. The temperature remained normal, and the calf was quite well. Two months after the second inoculation the tumour produced by it was the size of a goose's egg; that produced by the first inoculation was smaller, measuring 2½ in. by 1¼ in.

Resistance-test Inoculation. — The temperature remained normal for 24 hours. Forty hours after inoculation it rose to 40·0°C., and eight hours later to 40·6°C. The following day it was almost normal. (*See* chart.)

Within 24 hours of the inoculation there was a tender, hot, ill-defined oedematous local swelling 3 in. in greatest diameter.

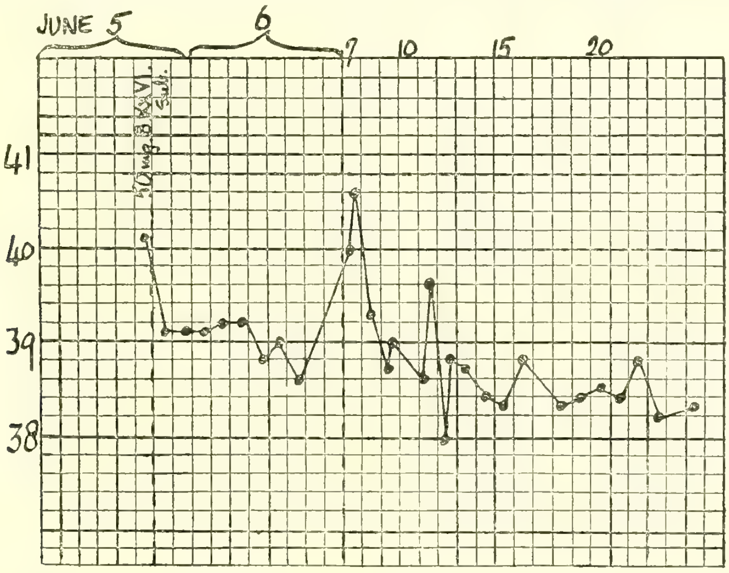
A fortnight after inoculation, a firm, subcutaneous local thickening could be felt, 3 in. by 1¾ in.; the prescapular gland was 3 in. in length. The calf was quite well and the temperature was normal.

On the 38th day there was a softened tumour at the seat of inoculation, 3 in. by 1½ in.; the gland was slightly enlarged.

On September 3rd, 90 days after inoculation, the calf was killed when in good health. The temperature had been normal subsequent to the rise recorded above.

Temperature.

The temperature during the fortnight following the resistance-test inoculation is given in the chart below. During the remaining period of the experiment the temperature was quite normal.



Each vertical division of the chart under the brackets represents an interval of three hours; elsewhere in the chart each division represents one day.

Weights.

	cwt.	qrs.	lbs.
October 4, 1905	1	0	25
April 3, 1906	2	2	0
June 25, 1906	3	1	3
September 3, 1906	3	3	21

The calf gained weight steadily during the experiment, the total increase during eleven months being 2 cwt. 2 qrs. 24 lbs. (average rate of gain per week: 3·3 lb.).

Tuberculin Test.—March 30, 1906. 146 days after first protective inoculation. Reacted. Rise of temperature, 1·7°C.

POST-MORTEM EXAMINATION.

Condition.—Good.

Protective Inoculations.—On the right side of the neck in the subcutaneous tissue there were two tumours.

The anterior one was rounded and measured 2¾ in. by 2½ in. by 1½ in. On section it consisted of a cyst with a fibrous wall adherent to but not infiltrating skin and muscle. It was filled with soft yellow caseopus and the walls were lined by reddish granulation tissue upon which there was a network composed of vessels and fibrous cords.

The posterior tumour measured 3 in. by 2 in. by 1 in. and consisted of tough white scar tissue with a few scattered calcareous foci in the deeper part.

Right Prescapular Gland. — The right prescapular gland measured 2½ in. by 1½ in. by ¾ in. On section it contained one pea sized nodule consisting of a collection of calcareous grains. The rest of the gland was normal except for scattered foci of congestion.

The Right Prepectoral, Axillary, and Cervical Glands were normal.

Resistance-test Inoculation.—On the left side of the neck in the subcutaneous tissues there was a flattened tumour measuring 3¼ in. by 1½ in. by 1¼ in. adherent to skin and muscle. There was no infiltration of the muscle and only an occasional soft caseous focus in the skin. On section the tumour contained a yellow caseo-purulent substance; the walls were composed of translucent fibrous tissue lined by dark red granulation tissue.

Left Prescapular Gland.—The left prescapular gland measured 3 in. by 1½ in. by ¾ in. Around the cortex were numerous small haemorrhagic foci collected mainly into patches, many of which showed minute grey and opaque gritty foci. There were also in the cortex two irregular soft caseous gritty nodules, the larger 2 cm. by 1 cm., the smaller 1 cm. by 5 mm. They were surrounded by zones of congestion and had a tendency to shell out.

Left Prepectoral Glands.—The left prepectoral glands were slightly enlarged and showed in the cortices haemorrhagic foci, one of which was slightly gritty.

The Left Axillary and Cervical Glands were normal.

Thorax.

Pleura.—Normal.

Lungs.—On the surfaces of the lungs there were scattered haemorrhagic foci and occasional dark red spots about 1 mm. in diameter. The substance of the lungs was normal.

Thoracic Glands.—One mediastinal gland contained a yellow caseo-calcareous tubercle the size of a rape seed. The other mediastinal glands and the bronchial glands were normal except for occasional haemorrhagic foci.

Heart and Pericardium.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Stomachs and Intestines, Gastric and Colic Glands.—Normal.

Mesenteric Glands.—There were scattered haemorrhagic foci in the mesenteric glands.

Spleen.—The spleen weighed 18 ozs. On section there was in the substance a single grey nodule 3·5 mm. in diameter containing a calcareous grain in the centre.

Liver and Portal Glands, Lumbar and Iliac Glands.—Normal.

Kidneys, Suprarenal Bodies, and Renal lymphatic Glands.—Normal.

Tongue, Pharynx, Tonsils, Larynx, and Trachea.—Normal.

Various Lymphatic Glands.

Precrural, Popliteal, Gluteal, Ischiatic, Pudic, and Submaxillary Glands.—Normal.

The Parotid and Retro-Pharyngeal Lymphatic Glands showed a few foci of congestion.

Microscopical Examinations.

(Smear preparations):—

Hæmorrhagic foci from Left Prepectoral Gland.—No tubercle bacilli.

Hæmorrhagic foci from Mesenteric Gland.—No tubercle bacilli.

CALF 414.

Protective Inoculation—June 5, 1906; subcutaneous inoculation on the left side of the neck of 0·001 milligramme of culture derived from Virus B. XXVI. (Bronchial glands).

Resistance-test Inoculation—July 26, 1906. [51 days after protective inoculation.] Subcutaneous inoculation on the right side of the neck of 50 mg. of culture derived from same source, Virus B. XXVI.

Weight at beginning of Experiment—2 qrs. 23 lbs. [Age about 5 weeks.]

Died—October 21, 1906. [138 days after the protective inoculation, and 87 days after the resistance-test inoculation.]

Clinical Notes.

Protective inoculation.—On the fourth day nothing could be felt at the seat of inoculation; on the 13th day there was a slight ill-defined thickening. On the 21st day there was a definite though small localised thickening. On the 38th day the local thickening had not increased in size, but the adjacent prescapular gland was slightly enlarged.

For 30 days following the inoculation the temperature remained normal; there was then a slight rise (maximum 39·8°C.) lasting ten days, after which the temperature was again normal. The general health of the calf was unaffected.

Resistance-test Inoculation.—Nine hours after inoculation the temperature rose to 40·2°C., and reached a maximum of 41·1°C. forty-eight hours after inoculation. After this it rapidly fell to normal. (*See chart.*)

Twenty-four hours after the inoculation there was a flat tender oedematous thickening 2½ in. in greatest width extending towards the dewlap.

On the 13th day there was a flat thickening 2 in.

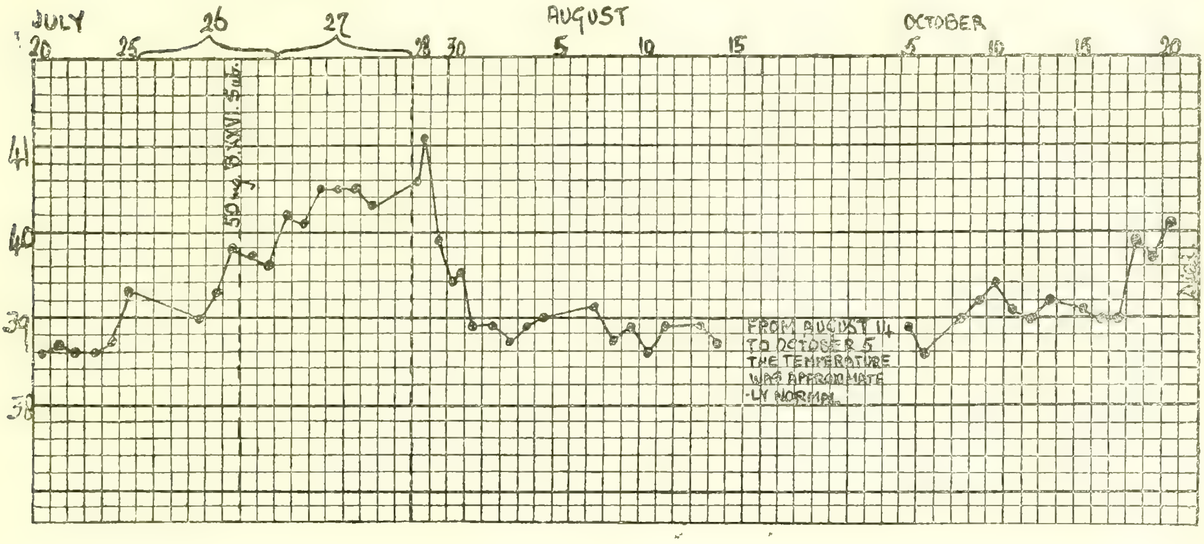
in greatest diameter, and the adjacent prescapular gland was slightly enlarged.

On the 50th day there was a softened tumour at the seat of inoculation, the size of a hen's egg, and the prescapular gland was slightly enlarged. The calf was in fairly good condition; the temperature was 38·4°C.

On the 87th day the calf died. It had not been obviously ill, but its condition had been poor for some time; on this day it became very ill, lying down with its head turned on to the left shoulder; it died in the evening. The temperature had usually been a little above the normal (maximum 39·4°C.); during the last three days it was high (about 40·0°C.).

Temperature.

The temperature subsequent to the resistance-test inoculation is shown on the chart.



Each vertical division of the chart under the brackets represent an interval of three hours; elsewhere in the chart each division represents one day.

Weights.

		qrs.	lbs.	
June 5, 1906	...	2	23	Protective inoculation.
June 25, 1906	...	3	5	
July 26, 1906	...	3	17	Resistance - test inoculation.
October 21, 1906	...	3	11	Died.

During the first 51 days (the period covered by the protective inoculation) the calf gained weight (22 lbs.). It lost 6 lbs. subsequent to the resistance-test inoculation.

POST-MORTEM EXAMINATION.

Condition.—Good.

Protective Inoculation.—On the left side of the neck in the subcutaneous tissues there was an oval flattened tumour measuring 1½ in. by 1 in. by ¼ in. It was adherent to skin and muscle but did not infiltrate. On section it was composed almost entirely of firm caseous tissue containing calcareous streaks and granules.

Left Prescapular Gland.—The left prescapular gland measured 2½ in. by 1¼ in. by ¾ in. On section about two-thirds of the cortex was replaced by firm caseo-calcareous tissue with a translucent fibroid margin. The rest of the gland contained irregular caseo-calcareous tubercles.

Left Prepectoral Glands.—Two left prepectoral glands were normal. A third the size of a pea contained scattered caseous foci in the cortex.

Left Axillary and Cervical Glands.—Normal.

Resistance-test Inoculation.—On the right side of the neck there was a roughly circular tumour 2 in. in diameter and ¾ in. in thickness. On section it consisted of a cyst filled with caseo-pus; the walls were covered with an adherent caseous lining which when stripped away left reddish granuation tissue.

Right Prescapular Gland.—The right prescapular gland measured 2½ in. by 1¼ in. by ½ in. It was firm and on section about two-thirds of the cortex was filled with discrete caseous slightly gritty tubercles. In the remainder of the gland there were a few scattered caseous tubercles. The tissues around the gland were oedematous.

Right Prepectoral Glands.—The right round prepectoral gland had the outer margin of the cortex filled with caseo-calcareous confluent tubercles leaving the centre free. Right reniform prepectoral gland normal.

Right Axillary Gland.—Normal.

Right Cervical Glands.—The right inferior cervical gland, 1¼ in. in length, had the greater part of its substance filled with caseo-calcareous tubercles mainly discrete and up to a millet seed in size. The right middle and superior cervical glands were normal.

The subcutaneous tissues of the neck were extremely oedematous.

Thorax.

Pleura.—Normal.

Lungs.—The lungs were oedematous and somewhat congested, but contained no tuberculous foci.

Thoracic Glands.—A left tracheo-bronchial gland showed a caseo-calcareous miliary tubercle. Other bronchial glands on both sides were normal.

The caudal mediastinal gland showed one opaque gritty tubercle. The neighbouring gland contained a collection of caseo-calcareous foci the size of a wheat grain. Other mediastinal glands were normal.

The tissues in the anterior mediastinum were oedematous.

Heart, Pericardium, and Diaphragm.—Normal.

Abdomen.

Omentum and Peritoneum, Intestines, Gastric, Mesenteric and Colic Glands.—Normal.

Spleen.—The spleen weighed 4 ozs. The surface appeared normal. In the substance there were three tubercles, in size from a hemp seed to a wheat grain. On section they consisted of softened caseous gritty substance, enclosed in a translucent capsule.

Liver and Portal Glands.—Normal.

Gall-bladder.—The gall-bladder was greatly distended, measuring 6½ in. by 3 in. Slight pressure caused fluid to escape from the duct. The walls of the bladder were thin, but otherwise normal, and the contained fluid was yellowish and mucinous.

Kidneys.—The cortices were normal; the pelves were oedematous.

At the termination of the left ureter, where it enters the bladder, there was a cystic dilatation, the size of an orange, filled with yellow caseo-purulent substance. The walls of the cyst were smooth, and it appeared completely shut off. The ureter above was not dilated.

Suprarenal Bodies and Renal Lymphatic Glands, Lumbar and Iliac Glands.—Normal.

The tissues of the pelvis were oedematous.

Tongue and Tonsils.—Normal.

Pharynx and Larynx.—The pharynx and larynx were slightly congested.

Special Glands.

Precrural, Pudic, Gluteal, Popliteal, Submaxillary, Parotid, Retro-Pharyngeal, Coeliac, and Ischiatic Glands.—Normal.

CALF 416.

Protective inoculation—June 5, 1906; subcutaneous inoculation on the left side of the neck of 0·001 milligramme of culture derived from Virus B. XXVI. (Bronchial glands).

Resistance-test Inoculation—July 26, 1906. [51 days after protective inoculation.] Subcutaneous inoculation on the right side of the neck of 50 milligrammes of culture derived from same source, Virus B. XXVI.

Weight at beginning of Experiment—3 qrs. 5 lbs. [Age about 5 weeks.]

Killed when well—October 23, 1906. [140 days after the protective inoculation, and 89 days after the resistance-test inoculation.]

Clinical Notes.

Protective Inoculation.—On the fourth day nothing could be felt at the seat of inoculation; on the 14th day there was a slight ill-defined thickening; on the 21st day a definite though very slight thickening could be felt. There was no further change in the local conditions. The temperature remained normal; the general health of the calf was unaffected.

Resistance-test Inoculation.—Twelve hours after inoculation the temperature rose to 39·9°C. and reached 41·2°C. 24 hours after inoculation. After this it slowly returned to the normal (*see* chart).

Twenty-four hours after the inoculation a tender ill-defined thickening could be felt, which measured 3 in. by 1½ in.; the right prescapular gland was not perceptibly enlarged.

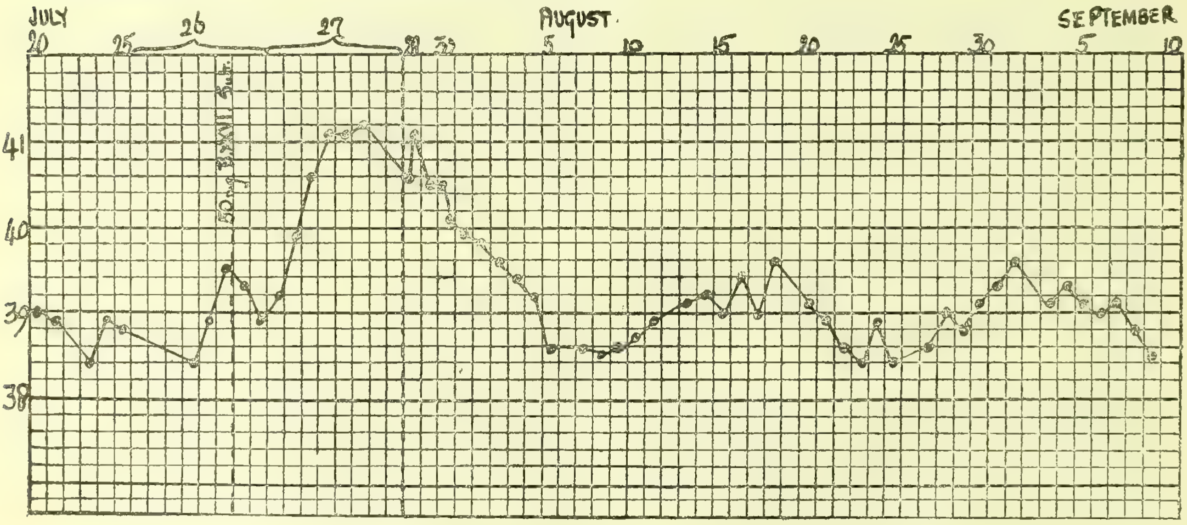
On the 13th day the flat local thickening measured 3 in. in greatest diameter, and the prescapular gland was slightly enlarged. Temperature normal (38·5°C.).

During the following month the swelling became smaller and softened, and on the 50th day measured 2 in. by 1½ in. The prescapular gland was still only slightly enlarged. The calf was in good health and the temperature normal (38·8°C.).

The animal was killed 89 days after the resistance-test inoculation. The temperature had been fairly normal since the initial rise recorded above; on two occasions it rose to 39·6°C. (*see* chart).

Temperature.

The chart shows the temperature of the calf for six weeks subsequent to the resistance test-inoculation. From September 9 to October 23 the temperature was normal.



Each vertical division of the chart under the brackets represents three hours; elsewhere in the chart each division represents one day.

Weights.

	cwt.	qrs.	lbs.	
June 5, 1906 ...	0	3	5	Protective inoculation.
June 25, 1906 ...	0	3	11	
July 26, 1906 ...	0	3	24	Resistance-test inoculation.
October 23rd, 1906 ...	1	0	10	Killed.

The calf slowly increased in weight during the experiment, the total gain of weight being 1 qr. 5 lbs.

Average rate of gain per week—1·6 lbs.

POST-MORTEM EXAMINATION.

Protective Inoculation.—On the left side of the neck there was no local lesion visible.

Left Prescapular Gland.—The left prescapular gland measured 1¾ in. by 1 in. One half of the gland contained several pea-sized collections of caseo-calcareous tubercles. In the other half there were only a few discrete caseo-calcareous tubercles not larger than pin-heads.

Left Prepectoral Glands.—A left round prepectoral gland was slightly enlarged and about half composed of gritty caseous substance. Two other left prepectoral glands were normal.

Left Axillary Glands.—Normal.

Left Cervical Glands.—The left inferior cervical gland contained a few discrete caseous tubercles. Other cervical glands were normal.

Resistance-test Inoculation.—On the right side of the neck in the subcutaneous tissues there was a rounded slightly prominent tumour 2¼ in. by ¾ in. On section it consisted of a fibrous walled cyst lined internally by grey granulation tissue thinly coated with caseous substance. It was divided by strands of translucent tissue passing from wall to wall and was filled with caseo-pus.

Right Prescapular Gland.—The right prescapular gland measured 1¾ in. by ¾ in. by ¼ in. On section it contained scattered discrete soft caseous tubercles up to a pinhead in size.

The Right Prepectoral, Axillary and Cervical Glands were normal.

Thorax.

Pleura.—Normal.

Lungs.—The lungs were somewhat voluminous. The surfaces of both showed numerous dark irregular congested patches varying from 1 mm. to 3 mm. in diameter. There were also scattered larger patches irregularly quadrilateral in shape ranging in size up to 1 cm. by 2 cm. On section the larger nodules corresponding in outline with lobules of the lung were composed of dark grey tissue with yellow caseous foci. Many of the smaller congested patches were grey in the centre with surrounding zones of congestion and some contained opaque caseous foci. The anterior lobe of the right lung was completely solid and in the condition of grey hepatisation: there could be seen throughout the tissue numerous minute caseous foci. The bronchi in this part of the lung were dilated and exuded a purulent fluid. On section the rest of the substance of the lungs showed numerous patches similar to those described on the surfaces.

Thoracic Glands.—The left bronchial glands were enlarged, and a considerable part of the cortices was composed of firm grey tissue containing irregular caseo-calcareous nodules up to a hemp-seed in size. The right bronchial glands were similar and contained discrete caseo-calcareous miliary tubercles. The caudal mediastinal gland measured 3 in. by ¾ in. On section it was deeply congested except for a narrow margin of the cortex which was firm and grey and contained numerous caseo-calcareous tubercles up to a millet-seed. The other mediastinal glands were similar.

Heart, Pericardium, and Diaphragm.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Stomachs.—Normal.

Intestines.—In the small intestine several of the Peyer's patches showed a few soft yellowish caseous tubercles up to a pinhead in size.

The large intestine was normal.

The Gastric, Mesenteric, and Colic Glands were normal.

Spleen.—The spleen weighed 4 oz. On section it contained one nodule the size of a hemp-seed, which consisted of translucent tissue with a soft caseous appreciably gritty centre.

Liver.—Just beneath the capsule of the liver on the convex surface there was a grey nodule the size of a wheat-grain with a caseous gritty centre. The rest of the surface was normal. On section through the substance there was one caseo-calcareous tubercle the size of a rape-seed.

Gall-bladder.—Normal.

Portal Glands.—In one portal gland there were about 20 discrete caseous gritty tubercles up to the size of a pin-head. Three other glands contained a few caseous tubercles, some soft, others gritty. One gland was normal.

Kidneys.—The kidneys showed in the superficial part of the cortices an occasional grey translucent tubercle. In the right there were also two tubercles 1 millimetre in diameter, with minute caseous centres.

Renal Glands.—The left renal gland contained a small collection of gritty caseous tubercles, and a few scattered caseous tubercles, none larger than a rape-seed, in the rest of the gland. The right renal gland showed three similar tubercles.

Suprarenal Bodies.—Normal.

Lumbar Glands.—Two lumbar glands each contained a pinhead-sized caseous tubercle. A third gland showed three smaller tubercles. Two other glands were normal.

Iliac Glands.—Normal.

Tongue, Larynx, Pharynx, and Tonsils.—Normal.

Various Lymphatic Glands.

The Left Precrural Gland contained a single translucent nodule the size of a hemp-seed, with a soft caseous centre.

Right Precrural Gland.—Normal.

Pudic, Gluteal, Popliteal, Pharyngeal, and Ischiatic Glands.—Normal.

The Right Parotid Gland showed a caseous nodule the size of a hemp seed.

Microscopical Examinations.

(Smear preparations.)

Tubercle from Kidney.—Two tubercle bacilli seen.

Tubercle from Liver.—Eight tubercle bacilli seen.

CALF 418. Control.

Subcutaneous inoculation of culture derived from the original material of Virus B. XXVI. (Bronchial glands).

Dose—50 milligrammes.

Date—June 5, 1906.

Weight—2 qrs. 8 lbs.

Died—August 20, 1906. [76 days after inoculation.]

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on June 5, 1906.

On the next day there was a slight thickening 1¼ in. in diameter. On the fourth day the thickening measured 2 by 1½ in. and the prescapular gland was slightly enlarged.

On June 16, 11 days after inoculation, there was a firm flat tumour 3½ in. by 2½ in., the skin over the central part of which had broken down exposing yellow caseo-necrotic material; the left prescapular gland measured a little over 3 in. in length.

On June 26, 3 weeks after inoculation, the tumour measured 4½ in. by 3 in. in area and about 1 in. in thickness; in the upper part there was a deep ulcer about half-an-inch in diameter; the prescapular gland measured $3\frac{1}{4}$ in. in length and a prepectoral gland was the size of a pea. The general condition of the animal remained good.

On July 6, 1906, 31 days after inoculation, the respirations were noticed to be slightly increased in frequency and the calf appeared to be losing flesh and was backward in its growth.

The tumour increased a little further in size and the ulcer gradually enlarged, a cavity being formed in the centre of the tumour.

The general condition of the animal remained much about the same for a long time, the respirations being only slightly more frequent than normal.

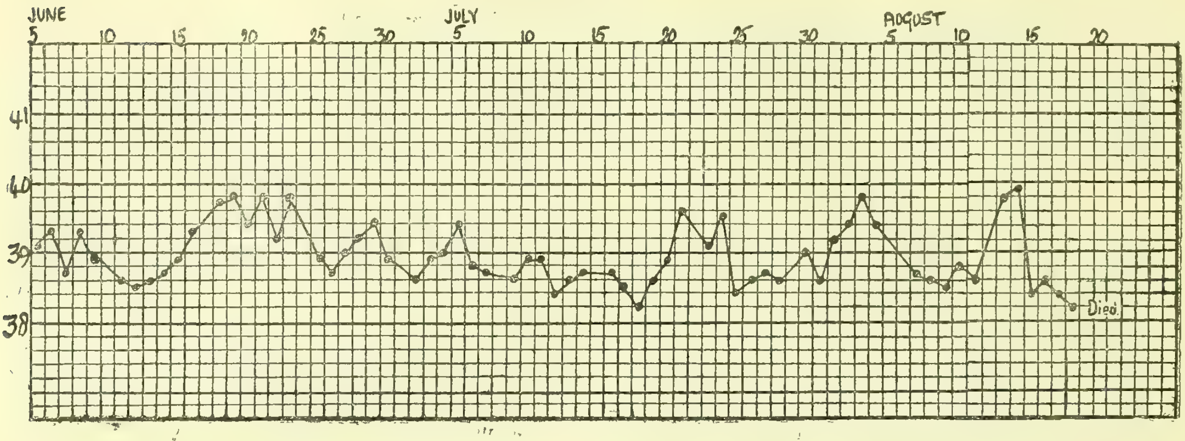
During the last week of life the respiration increased a little in frequency and became distinctly laboured. The calf was found dead on August 20, 1906.

Weights.

	cwt.	qrs.	lbs.
June 5, 1906	0	2	8
June 25, 1906	0	2	11
August 20, 1906	0	2	4

Loss in weight on the initial weight.—4 lbs

Temperature.



POST-MORTEM EXAMINATION.

Condition.—Moderate.

Local Lesion.—On the left side of the neck there was a somewhat flattened tumour measuring $5\frac{1}{2}$ in. in length, 3 in. in breadth and about 1 in. in greatest thickness. It showed on the external surface a deep ulcer, 3 in. by 1 in., which communicated with a flat space in the centre of the tumour; on section this space was found to be surrounded by a comparatively thin layer of dense yellow caseo-necrotic tissue which was adherent to the skin and slightly infiltrated the muscles; the internal wall, where exposed to the air through the ulcer, was covered with a brownish black layer of dried discharge; elsewhere the space was lined with soft rather foul-smelling caseo-pus.

Left Prescapular Gland.—The left prescapular gland weighed a little over 2 ozs., and measured 3 in. by $1\frac{1}{2}$ in. by $1\frac{1}{2}$ in. and on section was composed throughout of dense homogeneous yellow caseated tissue showing no sign of calcification; the capsule of the gland was slightly thickened.

The Right Prescapular Gland was normal.

Prepectoral Glands.—On the left side the rounded prepectoral, the size of a marble, was yellow and caseous around the margins, firm and translucent in the centre; the reniform gland, the size of a large bean, showed a large caseous patch at one extremity, elsewhere a pea-sized caseous nodule and several discrete caseous tubercles. On the right side the glands were normal.

Cervical Glands.—A lower cervical gland on the left side, the size of a thrush's egg, resembled on section the left prescapular; the left upper cervical gland contained two hempseed-sized caseous tubercles; other cervical glands on the left side were normal. On the right side two in the middle of the neck were enlarged to the size of kidney beans; one was three-quarters caseous; the other contained a pea-sized caseous nodule.

A gland just within the entrance to the thorax on the left side, the size of a pigeon's egg, was dense yellow and caseous practically throughout.

Thorax.

Lungs.—The lungs collapsed only partially and were congested and mottled with dark red angular patches of consolidation, largest and most numerous in the anterior lobes.

The lung parenchyma contained numerously evenly distributed nodules ranging in size from 2 mm. up to 1 cm. in diameter; these on section were yellow and caseous in the centre, grey around the margins, the larger ones having a lobular outline; between the nodules there were a few scattered tubercles with caseous centres up to 1 mm. in diameter.

The subpleural nodules projected beyond the surface and a few on the dorsal mediastinal surface were mushroomed.

On the ventral surface of the caudal lobes along the lines of the interlobular septa there were several clusters of flattened grey tubercles with yellow centres bound together by reddish connective tissue.

The Bronchial and Mediastinal Glands were moderately enlarged and together weighed 5 ozs.; on section the cortices were composed throughout of dense yellow caseated tissue showing here and there foci of congestion and in one or two of the glands minute islets of grey translucent tissue.

Pleura.—On the pleural surface of the diaphragm there was a moderate number of flattened nodules, the largest 2 mm., with yellow caseous centres; they occurred chiefly in small groups. On the caval fold of pleura there were several patches of firm reddish vegetations and a few discrete tubercles. Along the margins of the ribs there were continuous rows of reddish vegetations containing small tubercles.

Larynx.—Normal.

Trachea.—The mucous membrane in the anterior part showed a few congested caseous foci.

Abdomen.

Omentum.—The lymphatic fringes on the ventral surface of the omentum were congested and slightly hypertrophied and contained scattered reddish tubercles, the largest the size of a millet seed, some with yellow centres.

Parietal Peritoneum.—On the peritoneum near the margin of the ribs on the right side there was a lenticular nodule 5 mm. in diameter. The peritoneum covering the tendon of the diaphragm showed two patches of soft pinkish connective tissue and a number of small tubercles running parallel to the fibres of the tendon.

Spleen.—The spleen weighed 4 ozs. and showed on section a moderate number of firm yellow caseous nodules with narrow grey margins ranging in size from a hemp seed to a small pea (4 mm.); the subcapsular nodules caused slight projections and the capsule over them was slightly thickened and adherent.

Liver.—The liver showed on the surface moderately numerous nodules; a few of these were raised above the surface and had filmy grey margins, the largest measuring about 5 mm. in diameter; other nodules projected only slightly or were dimly seen through the capsule; on section the nodules were yellow and caseous and had narrow grey margins; similar nodules were evenly distributed throughout the substance.

Gall Bladder.—Normal.

Portal Glands.—The portal glands were enlarged, indurated and showed on section irregular yellow caseous patches surrounded by translucent fibroid tissue.

Kidneys.—The left kidney showed in the cortex a considerable number of pale grey foci, the largest the size of a pin's head; there were similar foci in the right kidney and also one or two larger ones with slightly opaque centres.

The Right Suprarenal Body showed in the cortex a yellow caseous nodule the size of a hemp seed.

Left Suprarenal Body.—Normal.

Alimentary Tract.

Tongue, Pharynx, and Left Tonsil.—Normal.

The Right Tonsil contained one softened caseous nodule.

Small Intestine.—In the lower part of the ileum there were numerous caseous nodules ranging up to a hemp seed in size, the majority of which were ulcerated; the rest of the small intestine appeared normal.

Large Intestine.—Several lymphoid follicles in the large intestine were enlarged and ulcerated, and showed in the centre some soft caseous substance.

Gastric Glands.—Two or three gastric glands were enlarged and composed of translucent grey tissue mottled with yellow caseous patches; others contained discrete caseous nodules.

Mesenteric Glands.—The glands at each extremity of the mesentery were slightly enlarged and showed their cortices extensively replaced by dense yellow caseous areas; other mesenteric glands contained discrete caseating nodules of various sizes.

Various Lymphatic Glands.

The Cœliac Glands were enlarged and showed on section yellow caseous areas surrounded by translucent fibroid tissue.

Lumbar Glands.—One lumbar gland showed the whole of the cortex composed of grey caseating tissue; the rest contained discrete caseating nodules.

The Left Precrural Gland contained a hemp seed sized caseous nodule; the right was normal.

Pudic Glands.—One contained a pea-sized caseous nodule; the other was normal.

Each Popliteal Gland contained a hemp seed sized caseous nodule.

The Right Gluteal, the Left Ischiatic, the Left Iliac and an Ilio-Sacral Gland each contained two or three firm yellow caseous nodules, the largest 4 mm. in diameter.

The Right Iliac, the Left Gluteal and the Right Ischiatic Glands were normal.

Axillary Glands.—Normal.

The Left Submaxillary Gland showed a yellow caseous mass replacing nearly half the substance, and a group of small caseous tubercles.

The Right Submaxillary Gland was normal.

The Right Retro-Pharyngeal Gland was enlarged and its substance extensively replaced by large yellow caseous nodules.

The Left Retro-Pharyngeal Gland contained three caseous nodules, the largest the size of a pea.

Haemolymph Glands.—Here and there a hæmolymph gland was seen to contain a caseous nodule.

Eyes.—Normal.

Testicles.—Normal.

CALF 422. Control.

Subcutaneous inoculation of culture derived from the original material of Virus B. XXVI. (Bronchial glands).

Dose—50 milligrammes.

Date—June 5, 1906.

Weight—2 qrs. 19 lbs.

Died—July 19, 1906. [44 days after inoculation.]

Clinical History.

The calf was inoculated subcutaneously on the left side of the neck on June 5, 1906.

On the next day there was a slight subcutaneous thickening 1½ in. in diameter. On the fourth day there was a slightly raised thickening measuring 3 in. by 1¾ in. in superficial area.

On June 16, 11 days after inoculation, there was a large infiltrating tumour moulded to and partly surrounding a large prescapular gland.

On June 26, three weeks after inoculation, the tumour measured 6 in. by 4 in. and between 1 in. and 2 in. thick; no change had as yet been observed in the general health.

On July 4, 1906, 31 days after inoculation, the respirations were observed to be a little increased in frequency.

On July 6, 1906, the respirations were definitely increased and the calf was obviously ill (rough coat, depression, etc.). It gradually got worse and lost flesh and strength. The respirations became only moderately increased in frequency and were never laboured.

The appetite remained good until towards the end of the experiment.

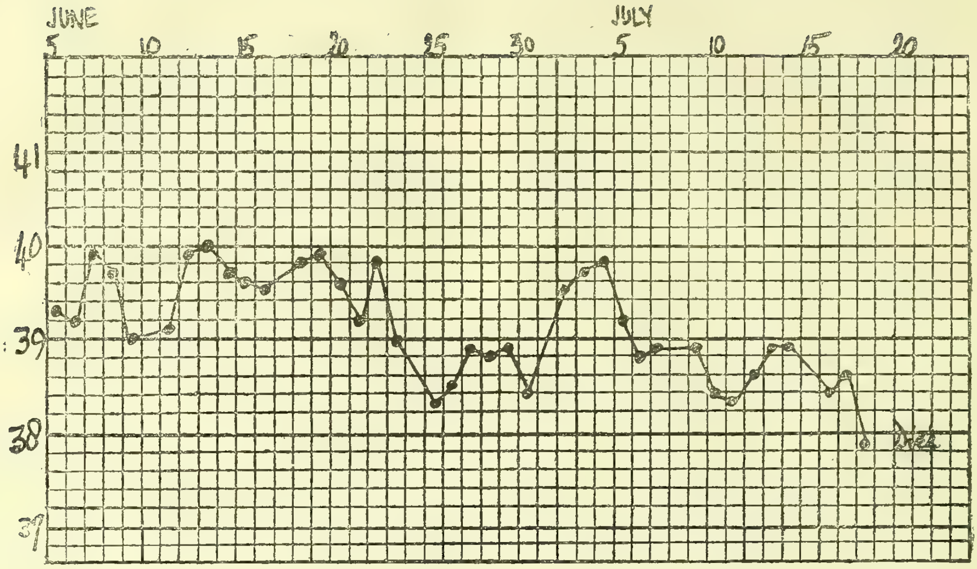
Weights.

There was a gain in weight of 1 lb. in the first 20 days and loss of 13 lbs. in the last 24.

	qrs.	lbs.
June 5, 1906	2	19
June 25, 1906	2	20
July 19, 1906	2	7

Loss in weight.—12 lbs.

Temperature.



POST-MORTEM EXAMINATION.

Condition.—Poor.

Local lesion.—On the left side of the neck there was a somewhat flattened tumour measuring 6 in. by 4 in., by 1¾ in. in greatest thickness; in the centre of the external surface there was a deep irregular ulcer, 1½ in. in greatest diameter, which communicated with a flattened space in the middle of the tumour lined with soft brownish necrotic material; on section the tumour was found to be composed of the usual dense yellow caseo-necrotic tissue, adherent to the skin and infiltrating the muscles; the intact skin was congested and a little thickened and beset with small yellow tubercles.

Left Prescapular Gland. — The left prescapular gland weighed 4 ozs., and measured 3½ in. by 2½ in. by 1¾ in.; on section the greater part of the cortex was composed of dense pinkish yellow caseous tissue whilst the rest was closely beset with caseous tubercles; the capsule of the gland was a little thickened.

Right Prescapular Gland.—The right prescapular gland was not enlarged; it contained a number of caseous nodules, occurring chiefly in groups.

Prepectoral Glands.—On the left side the spherical prepectoral gland was the size of a large pea and showed a few caseous foci in the cortex; the reniform gland was enlarged, one part of the cortex was firmer than normal and speckled with caseous points, in the rest of the gland there were a few discrete caseous nodules; another gland near the latter was slightly enlarged and showed a few early caseous foci.

Right Prepectoral Glands.—The right prepectoral glands contained discrete caseous nodules, the largest the size of a hemp-seed.

Cervical Glands. — On the left side one, a few inches from the thorax, 1 cm. in greatest diameter, was indurated and showed yellow caseous nodules closely set around the cortex; a gland, just within the entrance to the thorax, the size of a pheasant's egg, was composed practically throughout of dense yellow caseated tissue; the upper cervical gland contained three caseous nodules. The glands on the right side were slightly enlarged; each contained a few caseous nodules, similar to those in the peripheral glands.

Thorax.

Lungs.—The lungs were enlarged and mottled on the surface with irregular dark red patches of consolidation; these patches were most numerous in the left lung and caused almost complete consolidation of the ventral half of the cephalic and the antero-ventral portion of the caudal lobes.

The parenchyma of the lung was closely and evenly beset with yellow caseous tubercles, ranging in size from a pin's head to that of a hemp-seed; the subpleural tubercles, except on the dorsal surface of the caudal lobes, caused projections from the surface. Scattered about the substance of each of the lobes were solid caseating masses occupying a part or the whole of the lobule.

Thoracic Glands.—The bronchial and mediastinal glands were enlarged and weighed together 4 ozs.; on section the cortices were composed throughout of a dense grey translucent tissue closely beset with small irregular yellow caseous patches (these glands resembled the portal and cœliac glands, but were perhaps a little more advanced in caseation).

A small gland in the ventral mediastinal pleura near the apex of the heart, and the ventral mediastinal glands, contained yellow caseous nodules similar to those in the peripheral lymphatic glands.

Pleura.—The fringes along the margins of some of the ribs were congested and contained small grey tubercles occurring chiefly in clusters. The pleura covering the diaphragm showed a few groups of small tubercles.

Heart and Pericardium.—Normal.

Larynx and Trachea.—Normal.

Abdomen.

Omentum.—The omentum showed on its inferior surface about half-a-dozen lenticular nodules, yellow in the centre, ranging in size from a pin's head to a wheat grain.

Peritoneum.—Normal.

Spleen.—The spleen, enlarged, weighed about 6½ ozs.; there were no tubercles on the surface; the pulp contained moderately numerous firm yellow caseous nodules ranging in size from a millet to a hemp seed.

Liver.—The liver was normal in general appearance; on the surface sparsely scattered caseating tubercles were seen, varying in size from a mere point up to that of a millet seed; the larger tubercles were slightly raised above the surface and some had filmy grey margins; on section small caseous tubercles up to a pin head in size were very sparsely scattered throughout the substance.

Gall-bladder.—Normal.

Portal Glands.—The portal glands were considerably enlarged and showed on section the cortices closely beset with irregular yellow caseous nodules embedded in a firm grey translucent matrix.

Kidneys.—Each kidney showed in the cortex sparsely scattered caseous tubercles, with grey margins, the largest a little larger than a millet seed; the larger ones were elongated in a radial direction.

Suprarenal bodies.—The right contained one opaque yellow miliary tubercle; the left was normal.

Alimentary Tract.

Tonsils.—The left tonsil contained one caseous nodule ; none seen in the right.

Tongue, Pharynx.—Normal.

Thymus.—The thymus contained a millet seed-sized caseous tubercle.

Small Intestine.—In the long Peyer's patch there were fairly numerous caseous tubercles, the largest the size of a millet seed ; in the rest of the intestine tubercles were very sparsely scattered.

Large Intestine.—Normal.

The Mesenteric Glands contained discrete yellow caseous nodules irregular in outline, similar to those in the iliac glands ; in several these were aggregated together to form larger nodules ; the gastric, ileocolic and colic glands resembled the mesenteric.

Various Lymphatic Glands.

The Submaxillary, Retro-pharyngeal, Parotid and Mastoid Glands were slightly enlarged and contained numerous irregular firm yellow caseous nodules up to 4 mm. in diameter.

The Right Axillary Gland contained several caseous nodules ; in the left there was only one.

Cœliac Glands.—One cœliac gland was very large and on section resembled the portal glands ; a smaller gland showed yellow caseous nodules becoming confluent.

The Renal and Lumbar Glands were enlarged and closely beset with yellow caseous nodules.

The Iliac, Ilio-Sacral, Precrural, Pudic, Popliteal and Gluteal Glands showed a varying number of discrete yellow caseous nodules, irregular in outline, ranging up to 2 and 3 mm. in diameter.

Ischiatic Glands.—Normal.

Eyes.—Normal.

Testicles.—Normal.

Microscopical Examination.

(Smear Preparation) :—

Tubercle from Small Intestine.—Numerous tubercle bacilli.

CALF 474. Control.

Subcutaneous Inoculation on the left side of the neck of culture derived from Virus B. XXVI. (Bronchial gland).

Dose—50 milligrammes.

Date—July 26, 1906.

Weight at Inoculation—1 cwt. 1 qr. 23 lbs. [Age about 17 weeks.]

Killed when well—October 26, 1906. [92 days after inoculation.]

Clinical Notes.

The calf was inoculated subcutaneously on the left side of the neck on July 26, 1906. Twenty-four hours after the inoculation a well-defined local thickening 1 in. in diameter could be felt.

On the 13th day there was a hard infiltrating deep-seated local tumour, measuring about 6 in. by 4 in. ; it was in close contact with a very large prescapular gland, but the latter was not adherent to it. The animal was unwell, its temperature was raised, and its coat rough.

On the 28th day the tumour was firm and prominent, deeply infiltrating the muscles, particularly in the lower part. The prescapular gland was very large, 5 in. in length, and there was oedema around the lower part of the gland and the dewlap. The coat was rough, otherwise the general condition of the calf was moderately good. The temperature was almost normal, 39·1°C.

On the 50th day the tumour was roughly pear shaped, and slightly softened ; it measured 5½ in. by 3½ in. Between it and the large prescapular gland (4 in. by 2 in.) was a mass of infiltrated tissue. The calf was thinner.

No further changes of importance took place in the local conditions ; the general condition of the calf improved, and it gained considerably in weight. It was killed 92 days after inoculation.

Throughout the experiment the temperature was definitely above the normal, but was never high, the maximum being 39·9°C.

Weights.

		cwt.	qr.	lbs.	
July 26, 1906	...	1	1	23	Inoculated.
October 26, 1906	...	1	3	7	Killed.

Total gain of weight during experiment.—1 qr. 12 lbs.

Average rate of gain per week.—3 lbs.

POST-MORTEM EXAMINATION.

Local lesion.—At the seat of inoculation on the left side of the neck in the subcutaneous tissue there was a prominent irregular tumour, measuring 7 in. by 4¼ in. by 3½ in. and weighing with skin and muscle 1 lb. 9 ozs. It was adherent to and infiltrated both skin and muscle and was connected with the prescapular gland by a firm cord ½ in. in diameter. On section the tumour consisted of dense caseo-necrotic substance, honeycombed in one part and tending to form a cavity. The dependent portion of the tumour was divided into two limbs, one adherent to the skin, the other passing beneath and partly within the muscle.

Left Prescapular Gland.—The left prescapular gland weighed 2¼ ozs. and measured 3 in. by 2 in. by 1½ in. On section the gland tissue was almost entirely replaced by firm caseo-necrotic substance and there remained a triangular area of the cortex which contained discrete caseous streaks and foci.

Left Prepectoral Glands.—The prepectoral glands on the left side were slightly enlarged and firm and contained in the cortices caseous streaks and foci forming a fine network.

Left Cervical Glands.—One gland was enlarged and almost caseous throughout ; a second showed a fine caseous network in part of the cortex. A mid-cervical gland the size of a thrush's egg consisted throughout of dense caseo-necrotic substance with small hæmorrhages ; two other glands showed discrete caseous streaks. About half of the superior cervical gland was filled with a caseous network.

Thorax.

Heart, Pleura, Pericardium and Diaphragm.—Normal.

Lungs.—The lungs were a little voluminous, but were crepitant. The anterior lobes were oedematous. The surfaces of both lungs were mottled by moderately numerous discrete dark areas, which varied in size up to 1 cm. in greatest dimension. They were irregular but roughly quadrilateral in shape, and on section were composed of grey tissue with a caseous network surrounded by a dark congested area.

Mediastinal Glands.—The posterior dorsal mediastinal gland measured 4¾ in. in length and 1¼ in. at its widest part. On section the outer part of the cortex was firm and studded with yellow miliary tubercles and irregular caseous foci; the rest of the gland was congested. The other mediastinal glands presented a similar appearance.

Bronchial Glands.—The bronchial glands were somewhat enlarged and showed the same appearance of discrete caseous tubercles in fine grey cortical tissue.

Abdomen.

Omentum.—The omentum contained two rounded bodies the size of small peas which were made up of translucent capsules filled with caseous substance.

Peritoneum.—Normal.

Spleen.—The spleen weighed 5 ozs. There were no tubercles on the surface. On section it contained sparsely scattered caseous miliary tubercles with grey margins and uniform in size.

Liver.—In the liver, visible from the external surface, there were twelve tubercles varying from 5 mm. up to 2·5 mm. in diameter. These on section consisted of caseous gritty substance in a thin grey capsule. Section through the liver revealed in the substance only two more small tubercles.

Gall-bladder.—Normal.

Portal Glands.—The portal glands showed a moderate number of irregular discrete caseous tubercles in the cortices not larger than rape seed. In one there was a nodule 1 cm. in diameter, fibrous with a close caseous network.

Kidneys.—Each kidney showed on the surface two grey tubercles. On section there was in the right a translucent tubercle with a minute opaque centre.

Suprarenal Bodies.—Normal.

The Renal Lymphatic Glands on both sides contained scattered firm grey tubercles with caseous centres, up to a hemp seed in size.

Stomachs and Gastric Glands.—Normal.

Intestines.—Normal.

Mesenteric Glands.—The majority of the mesenteric glands were normal. In each of two there was a small caseous nodule with a grey margin; in three others there was a caseous tubercle the size of a wheat grain, and a few showed opaque foci in the superficial part of the cortices.

Tongue, Pharynx, Larynx, Tonsils, and Trachea.—Normal.

Various Lymphatic Glands.

Right Reniform Prepectoral and Right Axillary.—Normal.

The Right Rounded Prepectoral, Left Axillary, Right Iliac, Left Submaxillary, Right and Left Parotid, Right and Left Gluteal, Right and Left Precrural, Left Popliteal, Right and Left Retro-Pharyngeal showed a few discrete caseous tubercles, varying in number from one to several in each and in size up to a hemp seed.

A Coeliac and a Lumbar Gland showed a moderate number of discrete caseous tubercles.

Left Iliac, Right Submaxillary, other Coeliac and Lumbar Glands, and the Ischiatic Glands.—Normal.

CALF 476. Control.

Subcutaneous inoculation on the left side of the neck of culture derived from Virus B. XXVI. (Bronchial glands).

Dose—50 milligrammes.

Date—July 26, 1906.

Weight at Inoculation—1 cwt. 2 qrs. 10 lbs. [Age about 19 weeks.]

Died—September 21, 1906. [57 days after inoculation.]

Clinical Notes.

The calf was inoculated subcutaneously on the left side of the neck on July 26, 1906.

Twenty-four hours after the inoculation a slight local thickening could be felt, and the adjacent prescapular gland was slightly enlarged.

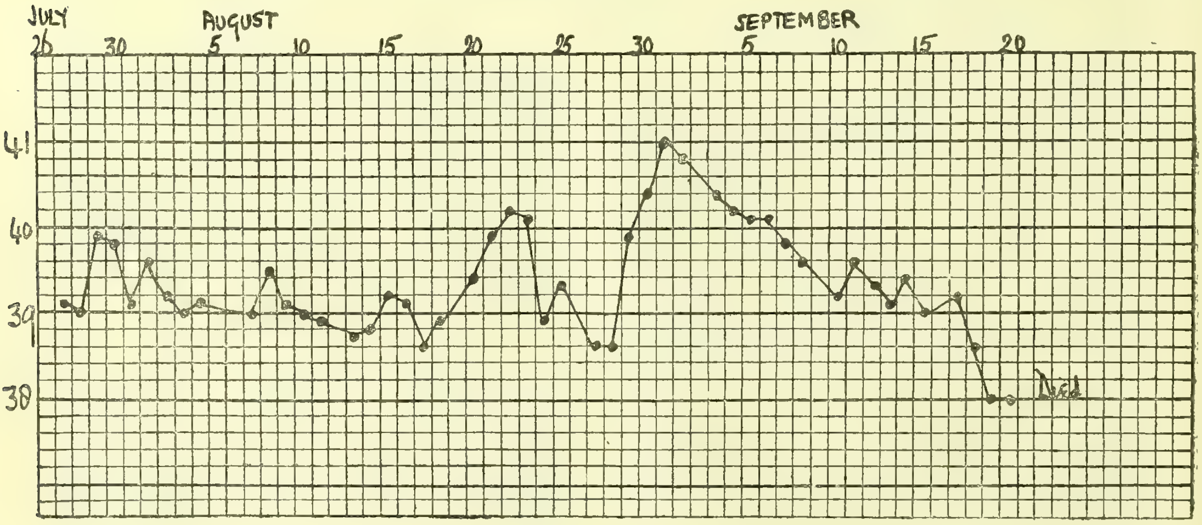
On the 13th day there was a firm square tumour, 5 in. by 4½ in., at the seat of inoculation; the prescapular gland was enlarged, 5 in. long. Calf in good condition; temperature a little raised, 39·5°C.

On the 23rd day the animal was unwell; its coat was staring, and it seemed to be losing flesh.

On the 28th day it was distinctly thinner; the coat was rough and the appetite poor. There was no obvious increase in the rate of respiration; the temperature was high, 40·1°C. The local tumour now measured 8 in. by 5 in. by about 2 in. in thickness, and the prescapular gland was 6 in. in length.

On the 50th day the breathing was difficult, and there was slight cough; the temperature, which reached 41·0°C. on the 36th day, had since been steadily falling, and was now 39·4°C. The calf rapidly became worse; on the 56th day the temperature had fallen to 38·0°C., and on the following day the calf died.

Temperature.



Weights.

	cwts.	qrs.	lbs.	
July 26, 1906 ...	1	2	10	Inoculated.
September 21, 1906	1	0	17	Died.

Total loss of weight during experiment.—1 qr. 21 lbs.
Average rate of loss per week.—6 lbs.

POST-MORTEM EXAMINATION.

Carcass very emaciated.

Local lesion.—On the left side of the neck there was a very large, pendulous, well-defined tumour measuring 8½ in. by 6½ in., by about 3½ in. in greatest thickness, and weighing 3½ lbs. The skin covering the central part of the tumour was necrosed and of a brownish black colour and showed several irregular ulcerous openings discharging ill-formed pus. On section the external portion was composed of juicy homogeneous caseo-necrotic substance, of a salmon-pink colour; the deeper portion was firmer, yellower and intersected by connective tissue trabeculæ. In the centre of the external portion there was an elongated lenticular cavity communicating externally and containing a small quantity of yellowish-brown foul-smelling caseo-pus; the caseous substance forming the anterior wall of this cavity was friable and highly necrotic. The skin around the periphery of the tumour was greatly thickened and composed throughout of soft congested caseo-necrotic substance.

Extending from the inferior extremity of the tumour to the inferior extremity of the prescapular gland were two thick cords, the largest 1 in. in diameter, composed of dense yellow caseated tissue; they terminated in a large caseous mass, divided into nodules by bands of fibrous tissue, which surrounded, and was intimately adherent to, the lower extremity of the prescapular gland. The muscles around this mass and the two cords were infiltrated with caseous tubercles running parallel to the muscle fibres.

The tissues around the lower part of the tumour and the nearest glands were thickened and oedematous.

Left Prescapular Gland.—The left prescapular gland measured 5 in. by 3 in. by 2¼ in. and weighed 13 ozs.; on section it was composed throughout of dense pinkish yellow and yellow caseated tissue showing foci of congestion but none of calcification; the capsule was distinctly thickened.

Right Prescapular Gland.—The right prescapular gland was enlarged and very oedematous; it contained an irregular caseous mass, 1·5 cm. in diameter, and half-a-dozen pea-sized caseous nodules.

Prepectoral Glands.—On the left side the spherical prepectoral gland was the size of a walnut and resembled on section the left prescapular gland; the reniform gland, a little over 2 in. in length, showed the cortex composed of firm grey tissue closely infiltrated with a yellow caseous network. The right prepectoral glands were enlarged and oedematous, but were not otherwise abnormal.

Cervical Glands.—Near the left mastoid process there were three large glands, the largest measuring 3 in. by 1½ in. by 1 in., the smallest 1¼ in. in greatest diameter; the former was caseous throughout and resembled the prescapular; the other two were caseous almost throughout and in less advanced stage than the prescapular. In the middle of the neck on the left side there was a gland, the size of a thrush's egg, which showed the greater part of the substance dense and caseous. Nearer the thorax there was a smaller gland, part of which was firm and caseating.

On the right side the upper cervical gland contained two caseous nodules, the largest the size of a hempseed; one in the middle of the neck contained a smaller caseous nodule.

Thorax.

Lungs.—On opening the thorax the lungs collapsed only partially. The ventral flap of the left cephalic lobe was adherent to the parietal pleura and there were also slight adhesions, easily torn through, between the right cephalic lobe and the chest wall, and between the contiguous surfaces of the different lobes of each lung.

The lobes on the right side were mottled with diffuse dark red areas of consolidation, the small middle lobe being almost entirely airless. In the left lung there were similar areas of consolidation but these were more isolated except in the ventral flap of the cephalic lobe which was almost quite solid.

The surfaces of the lungs, except the dorsal surfaces of the caudal lobes, were studded with slightly raised yellow nodules, flattened on the surface, a few in the cephalic lobes being slightly mushroomed; they varied in size up to about 8 mm., were irregular in outline and were here and there aggregated together to form larger masses; on section they were firm and almost uniformly yellow and caseous; besides the larger nodules there were numerous grey tubercles with caseous centres ranging from a mere speck up to a millimetre or more in diameter; on section similar nodules and tubercles were distributed throughout the lung parenchyma; they were least numerous in the extreme posterior portions of the caudal lobes.

Thoracic Glands.—The bronchial and mediastinal glands were considerably enlarged and formed a continuous chain along the dorsal medeastinum; they weighed together 11 ozs., the caudal gland measuring 5 in. in length; on section their cortices were firm, yellow and with the exception of minute islets of congested grey tissue caseous throughout. The peribronchial glands were similarly affected.

Pleura.—The lymphatic fringes along the margins of the ribs were slightly hypertrophied and congested in places and contained a few scattered flattened caseous nodules ranging from 2 to 5 mm. in diameter.

There was similar hypertrophy of the fringes on the pleural surface of the diaphragm, chiefly around the margins of the tendon and along the line of reflexion of the caval fold of pleura; there were also a few flattened caseous nodules, up to 5 mm. in diameter.

Trachea.—The mucous membrane of the trachea near the larynx showed a slightly raised ulcerated caseous nodule.

Abdomen.

Omentum.—On the inferior surface of the omentum there were about half-a-dozen loosely attached lenticular nodules, the largest about 8 mm. in diameter; they were very dense, yellowish in the centre and two were deeply hæmorrhagic.

Peritoneum.—On one of the vesical folds of peritoneum there was a similar pea-sized nodule attached by a long pedicle.

Spleen.—The spleen was not apparently enlarged, and weighed 8 ozs.; on section there were moderately numerous firm spherical yellow caseous nodules ranging from 2 to 5 mm. in diameter.

Liver.—The liver showed on the surface under the capsule moderately numerous nodules ranging in size from about 1 up to 6 mm. in diameter; the larger ones projected slightly from the surface but were not mushroomed. On section similar nodules were evenly distributed throughout the substance; they were firm, yellow and homogeneous. Besides the larger nodules the substance contained numerous minute greyish white tubercles. On the dorsal surface of the liver, lying in a depression in the liver substance, was a large yellow mushroomed nodule measuring 1·5 cm. in diameter.

Gall-bladder.—Normal.

Portal Glands.—The portal glands were much enlarged, very oedematous and closely beset with firm caseating nodules in places confluent.

Kidneys.—The left kidney showed on the surface three grey miliary tubercles with opaque centres and two yellow caseous nodules, with narrow grey margins, the size of hempseeds; in the depth of the cortex one hempseed sized nodule was seen; the cortex also contained numerous greyish white translucent foci, ? early tubercles.

The right kidney showed on the surface about a dozen caseous nodules ranging in size from a millet seed to a pea; the larger ones were elongated in a radial direction; there were also numerous minute grey foci as in the left kidney.

Suprarenal bodies.—The right suprarenal showed in the cortex two whitish pinhead-sized tubercles.

Alimentary Tract.

Tongue, Pharynx and Tonsils.—Normal.

Small Intestine.—Appeared normal.

Large Intestine.—Several of the follicles in the cæcum were enlarged and caseous and the mucous membrane over them was congested.

Mesenteric Glands.—The chain of mesenteric glands contained numerous firm caseous nodules varying in size from a pea to that of a broad bean.

Colic Glands.—Several showed caseating nodules.

Eyes and Testicles.—Normal.

Various Lymphatic Glands.

Cœliac Glands.—Enlarged, indurated and advanced in caseation.

Lumbar Glands.—Slightly enlarged, contained several large caseating nodules, some aggregated together.

Ilio-Sacral Glands.—One contained a caseous nodule 5 mm. in diameter.

Iliac Glands.—The right contained six firm yellow caseous nodules, the largest 6 to 7 mm. in diameter; the left contained four.

Precrural Glands.—There was one small nodule in the left and two groups of tubercles in the right.

Popliteal Glands.—The left contained one yellow nodule 8 mm. in diameter, the right three each about 4 mm. in diameter.

Gluteal and Pudic Glands.—There were three caseous nodules in the right gluteal, one in the left, and several large ones in the pudic glands.

Submaxillary Glands.—The left contained three large caseating nodules; the right two groups of smaller nodules.

Pharyngeal Glands.—Each contained numerous caseous nodules up to 8 mm.

Parotid Glands.—There was one small nodule in the left; the right was normal.

Axillary Glands.—The left was enlarged and showed more than half its cortex in a state of early caseation; the right was normal.

Report (Submitted to the Commission in 1906) on the Stability of Virulence of Tubercle Bacilli in the Living Animal.

BY

DR. L. COBBETT.

NOTE.—Graphic Charts, illustrating the experiments dealt with in the Report, are included with others in Volume VII of the Appendix.

REPORT ON THE STABILITY OF VIRULENCE OF TUBERCLE BACILLI IN THE LIVING ANIMAL.

Submitted to the Commission in 1906.

PART I.

It has already been stated that the tubercle bacilli obtained from man and investigated at Blythwood Farm are, with the exception of a virus derived from a case of lupus, divisible into two groups according to their virulence for various animals. Both are highly virulent for the guinea-pig and monkey. One, which we call Group I., is highly virulent also for the ox, goat, pig, and rabbit; while the other, which we call Group II., and which is the common bacillus of human tuberculosis, possesses only a very low degree of virulence for these animals.

Viruses with an intermediate degree of virulence for the animals last mentioned have not been found, but one, namely H. 49. "T.C.", and perhaps also H. 20. "F.L.", have possessed a virulence when first tested which was not quite up to the standard of Group I. It is significant that the former was the only virus of this group which we obtained from a young adult. All the rest were from small children.

It cannot be doubted that the two kinds of tubercle bacilli which constitute our Groups I. and II., while sharply differing in their comparative virulence, are nevertheless closely related, and must have had a common origin in the past; and it is of great practical importance for the purpose of our investigation to enquire whether these two types have now become fixed and immutable, or whether it is possible under suitable conditions to convert the one into the other. This report deals with the experimental evidence of the possibility of raising the virulence for the ox and rabbit of strains of tubercle bacilli of human origin which have but slight virulence for these animals.

Many strains belonging to Group II. have been passed from calf to calf, or from one animal to another of another kind, without any appreciable modification in the virulence. For example, H. 8. "S.C." and H. 12. "H.N." The evidence of this is contained partly in the general tables of the Appendix to the 2nd Interim Report, Vol. II., and in the second part of this Report will be found the more important of these modification experiments which have had a *negative* result. In the first part will be collected together the details of those experiments in which the virulence of the strain used has undergone a definite change.

In all of these latter experiments but one the strain of tubercle bacilli was at the start feebly virulent for calves and rabbits, and was, in fact, an ordinary example of a strain of Group II., and it became highly virulent for these animals before the end. These experiments which gave positive modification results were four in number, namely H. 16. "J.H.", H. 17. "Sp. B.", H. 13. "A.D.", and H. 21. "G.B."

In another case, the strain of bacilli known as H 49. "T.C." was at the start only slightly less virulent for calves and rabbits than typical members of our Group I.; and it recovered full virulence for these animals after passing through a single calf. In still another case the strain known as H. 20. "F.L." probably underwent a similar modification (*see* Appendix to 2nd Interim Report, Vol. II, p. 489).

These instances of modification will be described in detail. The time, however, has not come to draw any final conclusions from them. Their interpretation must remain in suspense. They may be true instances of a conversion of a virus of Group II. (*Typus humanus* of the Germans) into a virus of Group I. (*Typus bovinus*), or they may be susceptible of some other interpretation. The question must continue to be investigated and judgment deferred until further evidence is available. In the meantime the facts already ascertained will be stated so that the reader may be in a position to review the evidence, as far as it goes, for himself.

MODIFICATION OF VIRULENCE OF THE VIRUS H. 16. "J.H."

The tuberculous material which formed the starting point of this experiment was obtained from a man, J.H., who was operated on for a tuberculous knee joint in 1903. There was no pulmonary disease, and the man, except for his knee, was in good health.

The tuberculous material received at Blythwood Farm, consisting of a quantity of gelatinous synovial membrane, was made into an emulsion with normal salt solution. This emulsion was estimated to contain 400 tubercle bacilli per cubic centimetre. Two calves, Nos. 155 and 157, were subcutaneously injected on the side of the neck on 18th June, 1903, each receiving 25 cc. of the emulsion, and therefore approximately 10,000 tubercle bacilli. Subsequent experience has shown that this dose, even if it consists of bacilli of Group I., is not sufficient to produce *with certainty* general progressive tuberculosis. (*See* table of tissue emulsions into calves, Appendix to 2nd Interim Report, Vol. II, p. 1035.)

Calf 155 was killed 54 days after injection. It was at that time in good health and had grown well. At the seat of injection was a small fibrous tumour infiltrated with caseous points. The prescapular and prepectoral glands on the same side contained caseating nodules. Four minute grey tubercles were found in the lungs similar to those often seen since in calves injected with a virus of Group II., and one doubtful speck was seen on the surface of the liver. In none of these little foci were tubercle bacilli found. The rest of the animal was normal.*

An emulsion was made from the local lesion and prescapular gland of this calf, and 20 cc. were injected under the skin of the neck of Calf 229 on 11th August, 1903. The number of tubercle bacilli estimated in the dose was 712,800. The animal was killed 91 days after injection when in good health. There was a small fibro-calcareous tumour at the seat of injection, and the prescapular and prepectoral glands on the same side contained a few calcareous grains.

Calf 157 was killed 67 days after injection. Like its fellow it had grown well. There was a small fibrous tumour with yellow calcareous grains at the seat of injection, and some calcareous nodules in the prescapular and prepectoral glands of the same side. There was also a small calcareous focus in the right bronchial gland. The rest of the animal was normal. An emulsion was made of the prescapular and prepectoral glands, 10 cc. of which, estimated to contain 3,000,000 tubercle bacilli, were injected subcutaneously on the left side of the neck into Calf 187.

This animal was killed 81 days after injection, and again the lesions were found to be limited to the seat of inoculation and the nearest lymphatic glands.

Thus so far four calves had been inoculated, and minimal lesions only had been produced. The doses, however, had contained only moderate numbers of tubercle bacilli. It will nevertheless be seen that after the virulence of the virus had become modified, similar doses were quite sufficient to produce general tuberculosis, which in all the calves but that which received the smallest dose was severe. Thus there is evidence that at this stage we were dealing with a virus which was not virulent for the ox species. It was not tested at this stage on rabbits

An emulsion having been made of the local lesion and prescapular glands of Calf 187, 25 cc., estimated to contain nearly 11,000,000 tubercle bacilli, were injected subcutaneously into the left side of the neck of Calf 273. The dose was the largest hitherto given with this virus.

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* Full post-mortem notes of this and other calves mentioned in the Report will be found in Vol. II of the Appendix to the 2nd Interim Report.

The animal remained in good health, and was killed 89 days after the inoculation, having gained 61 lbs. At the seat of inoculation a solid caseo-necrotic tumour was found, containing a small central cavity and infiltrating both skin and subjacent muscle. The left prescapular and prepectoral glands were much enlarged, and were caseous throughout. The thoracic glands were enlarged and firm, and were closely studded with little caseo-calcareous nodules. The lungs were extensively, but not severely affected, their surface was studded with tubercles, some of them $\frac{1}{3}$ in. in diameter, and similar tubercles were found scattered throughout their substance. The centres of these tubercles were found to be caseous. One nodule rather larger than the rest, and spherical in shape, proved to be a cyst containing softened greenish pultaceous matter. No tubercle bacilli were found in its contents. In the liver and spleen were a few rather large tubercles. The kidneys were normal. A few caseo-calcareous foci were found in the glands of the portal fissure, but the mesenteric and other lymphatic glands were normal, with the exception of the right superficial parotid, in which was a caseous focus the size of a large pin's head. The intestine was normal, except for a minute speck in one of the Peyer's patches, in which one tubercle bacillus was found.

This animal then was the first of this series to develop general tuberculosis, but the disease was not of the severest type.

An emulsion was made from the prescapular gland, and 20 cc., estimated to contain 3,000,000 tubercle bacilli, were injected subcutaneously into the right side of the neck of each of the two calves 337 and 355. It will be observed that the number of bacilli injected was approximately the same as that injected into Calf 187.

No. 337 was killed 80 days after the injection, never having been seriously ill, and having gained 2 qrs. 13 lbs. in weight. There was a large fluid tumour at the seat of inoculation, and caseo-necrotic nodules and calcareous foci in the prescapular and prepectoral glands. On the surface of the lungs was a small number of raised tubercles $\frac{1}{4}$ in. to $\frac{1}{8}$ in. in diameter, and a large number of smaller tubercles dark and translucent, only a few of which contained opaque centres. Similar little tubercles were scattered thickly throughout the organ. Two little tubercles were seen on the surface of the liver, and one in its interior. A moderate number of tubercles were seen in the spleen and a few in the kidneys, and some tubercles were found in the hepatic and mesenteric glands. This calf was rather more severely affected than 273.

No. 355, on the other hand, became seriously ill, and 43 days after the injection was killed when in an apparently dying condition.

At the seat of inoculation was a large solid infiltrating tumour. Very numerous miliary tubercles were found in all the organs. The thoracic glands were caseo-necrotic and tubercles were found in many other of the lymphatic glands of the body.

This, then, was a case of acute general tuberculosis, not perhaps of the severest type seen here, but nevertheless of considerable severity when the relatively small dose of 3,000,000 bacilli is taken into consideration.

An emulsion made of the prescapular gland of this animal was estimated to contain over 4,000,000 bacilli per cc. It was injected subcutaneously into four calves, in doses estimated to contain 10,000, 712,000, 3,000,000, and nearly 11,000,000 tubercle bacilli respectively, the first three repeating the doses injected into the calves already mentioned.

No. 281, which received the largest dose of bacilli, was killed when very ill 54 days after injection, having gained 24 lbs. in weight. It was found to have severe general miliary tuberculosis.

No. 317, which received 3,000,000 bacilli, was killed when ill 80 days after injection, having gained 20 lbs., and general miliary tuberculosis was found, slightly less severe than that in 281.

No. 343, which received 712,000 bacilli, was killed 68 days after injection when very ill. It had gained 11 lbs. It was found to have acute miliary tuberculosis more severe than in 317, and every lymphatic gland in its body was tuberculous. This was a very severe result considering the smallness of the dose.

No. 371, which received 10,000 bacilli, was killed 66 days after injection when apparently in good health and having gained 2 qrs. 4 lbs. A calcareous lesion was found at the seat of inoculation, and the nearest lymphatic gland was enlarged and caseo-necrotic. There was a small number of tubercles in the lungs, grey, with small caseous centres. Two small tubercles were found in the liver and two in the spleen.

There were some tubercles also in the thoracic, hepatic and one of the mesenteric glands. This animal was therefore distinctly more affected than the two original calves which received a similarly small dose.

At this stage of the experiment it was thought advisable to inject some adult bovine animals, in order to determine whether the virus had really reached the highest pitch of virulence for this species. All the calves were then dead, but a rabbit, No. 66, had also been injected with the emulsion used for the last four calves. It died of general tuberculosis after 85 days, and an emulsion rich in tubercle bacilli was made of some of its tuberculous lesions. This was injected into a heifer of nearly two years of age weighing over 5 cwt., and into a yearling bull weighing 3 cwt., in doses of 20 cc. estimated to contain over 157,000,000 bacilli.

The bull, 423A, was killed when very ill 42 days later. It was found to have an enormous solid tumour at the seat of inoculation, and severe miliary tuberculosis of all its organs and lymphatic glands.

The heifer, 245, proved to be more resistant. It was killed 209 days after injection when fairly well. It was found to have severe tuberculosis of lungs of the perlsucht type, and a slight amount of tuberculosis of the spleen and kidney. The liver was normal, except for some thickened bile ducts.

The animal was pregnant when injected, and gave birth to a calf 16 days before it was killed. The chorion was studded with little tubercles in which bacilli were found, and after the death of the heifer tubercle bacilli were found in scrapings from one of the cotyledons of the uterus.

The calf was killed 5 days after birth, and a few foci which contained tubercle bacilli were found in the hepatic glands.

SUMMARY OF THE ABOVE EXPERIMENTS WITH H. 16. "J.H."

The total duration of the experiment was eighteen months, during which the virus had passed through six generations of animals, namely five bovines and one rabbit. At the commencement it was practically non-virulent for bovines and quite incapable of setting up a fatal or progressive infection in them. At the termination it was fully as virulent for them, and for rabbits, as any of our Group I. strains. Moreover, there can, I think, be no doubt that the virulence increased gradually, and this can be clearly seen in the drawings which indicate the extent of the lesions, especially if Calves 187, 337, 335, and 317, which received approximate equal doses, be compared. (*See* Vol VII of the Appendix.)

CULTURES FROM THE PRECEDING ANIMALS.

Cultures were obtained from the original material through Guinea-pig 609, and from the third, fourth (two), fifth and sixth calves of the series, namely from 273, 337 and 355, 317 and 423A.

The first two of these cultures possessed the characters of growth of those strains which have a feeble virulence for bovine animals, the last had the dysgonic characters of growth characteristic of the strains which are highly virulent for these animals. The cultures from the fourth calf possessed intermediate characters of growth on artificial media, while that from the fifth calf approximated to that from the sixth.

Thus not only had a gradual change of virulence, but a gradual change of cultural characters also taken place in this strain of tubercle bacilli in its passage through these animals, and this had occurred within a period of a year and a half.

ESTIMATION OF THE VIRULENCE OF THE ABOVE-MENTIONED STRAINS OF CULTURE.

These strains, with the exception of that from 355, were each of them injected in 50 mg. doses into two calves. That from Calf 337 was injected in 10 mg. doses also.

The cultures were grown upon serum, and were three weeks old when injected. The total duration of artificial cultivation at the time of the injections was as follows: That from Guinea-pig 609, 14 months; that from Calf 273, 10 months; from Calf 337, 12 months; from Calf 317, 10 months; and from Bull 423A, 3 months.

The culture obtained from the guinea-pig injected with the human synovial membrane produced minimal lesions only, no tubercles being found beyond the nearest lymphatic glands.

That from Calf 273, the first to be affected with general tuberculosis, produced also minimal lesions in the two calves injected with it. In one of them there were also minute translucent tubercles in the lungs, but no significance can be attached to this fact. (*See* Vol. III of Appendix to 2nd Interim Report, Page 211.)

Rabbits also were injected at the same time as the calves, and these, too, developed minimal and non-progressive lesions.

It was surprising that this culture obtained from a calf which had general tuberculosis had little or no more virulence for the bovine species and rabbits than that obtained from the human synovial membrane; for the bacillus, when it existed in this calf, must have been virulent or the animal would not have developed general tuberculosis. Moreover a rabbit, No. 39, injected with an emulsion of the tissue from which the culture was made (prescapular gland) developed general tuberculosis. One can only conclude that the virulence of the virus from this animal had undergone a change during the artificial cultivation, and that the culture obtained from this calf, the first of the series to develop general tuberculosis, was unstable as to its virulence.

This is a very important point, for, as the sequel will show, a similar observation was made in every one of the successful modification experiments, except H. 21. "G.B."

The culture from 337, the fellow animal to the fourth calf of the series, produced acute miliary tuberculosis in each of the two calves injected with it, both these animals being in a dying condition when killed 49 days after injection. The cultures from Calf 317 and from Bull 423A also caused acute miliary tuberculosis of a somewhat more severe kind and which proved more rapidly fatal, in 33, 35, 39 and 25 days respectively.

The culture injections, therefore, clearly demonstrate the change of virulence which had been previously shown by the injections of emulsions of tuberculous tissue, but they do not show so clearly that the change was a gradual one. This is largely because the strain derived from Calf 273 had entirely lost its virulence when tested.

There is some evidence that the virus after the fourth passage was slightly less virulent than it afterwards became. But the rabbits injected at the same time as these calves with 10, 1, and 0·1 mg. respectively do not confirm this. Nor do the calves injected with 10 mg. of the culture derived from Calf 337 lend it much support for these animals both developed fatal miliary tuberculosis and died in 63 and 91 days respectively. The duration of the disease was not so short in these as in many other animals injected with the same dose of a Group I culture, nevertheless the great variability in the susceptibility of different individual calves to tuberculosis makes it impossible to regard this as giving any strong support to the other evidence of a *gradual* increase of virulence.

BOVINE ANIMALS INJECTED WITH THE VIRUS H. 16. "J.H."

I.—Tissue Emulsions.

—	Number of Animal.	Mode of Inoculation.	Estimated dose of Tubercle Bacilli.	Fate of Animal and Condition at Death.	Amount and Range of Tuberculous Lesions at Death.
Bovines Injected with Emulsion of Tissues from Human Knee Joint.					
—	Calf **155**	Subcutaneous	10,000	Killed when well after 54 days.	Local tuberculosis.
—	Calf **157**	„	10,000	Killed when well after 67 days.	Slight tuberculosis.
Bovines Injected with the Virus descended from Calf 157.					
1st Passage ...	Calf **187**	Subcutaneous	3,002,000	Killed when well after 81 days.	Local tuberculosis.
2nd Passage...	Calf **273**	„	10,903,325	Killed when in fair health after 89 days.	General tuberculosis, slight.
3rd Passage...	Calf **337**	„	3,062,000	Killed when in fair health after 80 days.	General tuberculosis, slight.
	Calf **355**	„	3,062,000	Killed when dying after 43 days.	General tuberculosis, moderate.
4th Passage ...	Calf **281**	„	10,900,000	Killed when very ill after 54 days.	General tuberculosis, severe.
	Calf **317**	„	3,060,000	Killed when ill after 80 days.	General tuberculosis, moderate.
	Calf **343**	„	712,000	Killed when very ill after 68 days.	General tuberculosis, severe.
	Calf **371**	„	10,000	Killed when well after 66 days.	General tuberculosis, slight.
5th Passage ...	Bull **423A**	„	157,266,000	Killed when very ill after 42 days.	General tuberculosis, severe.
	Heifer **245**	„	157,266,000	Killed when in no immediate danger of death after 209 days.	General tuberculosis, moderate.
Calf Injected with the Virus descended from Calf 155.					
1st Passage ...	Calf **229**	Subcutaneous	712,800	Killed when well after 91 days.	Local tuberculosis.

BOVINE ANIMALS INJECTED WITH THE VIRUS H. 16. "J.H."—*continued.*

II.—Cultures (Calves only).

Subcutaneous.

——	Immediate Source of Culture.	Total Duration of Cultivation.	Number of Calf.	Weight in Kilos.	Fate of Animal and Condition at Death.	Amount and Range of Tuberculous Lesions at Death.
			A.—Dose: 50 Milligrammes.			
—	Guinea-pig 609, from human knee-joint.	14 months	527	69·39	Killed when well after 90 days.	Slight tuberculosis.
—	"	"	549	70·76	Killed when well after 89 days.	Local tuberculosis.
2nd Passage ...	Calf 273	10 months	567	83·46	Killed when well after 90 days.	Local tuberculosis.
"	"	"	573	63·50	Killed when well after 90 days.	Slight tuberculosis.
3rd Passage ...	Calf 337	13 months	789	50·34	Killed when dying after 49 days.	General tuberculosis, moderate.
"	"	"	795	46·25	Killed when dying after 49 days.	General tuberculosis, moderate.
4th Passage ...	Calf 317	10 months	711	40·82	Killed when dying after 33 days.	General tuberculosis, severe.
"	"	"	729	42·18	Killed when dying after 35 days.	General tuberculosis, severe.
5th Passage ...	Bull 423A	3 months	541	66·20	Killed when very ill after 25 days.	General tuberculosis, severe.
"	"	"	559	78·92	Killed when dying after 39 days.	General tuberculosis, severe.
			B.—Dose: 10 Milligrammes.			
3rd Passage ...	Calf 337	13 months	779	50·80	Died after 63 days	General tuberculosis, moderate.
"	"	"	783	46·70	Died after 91 days	General tuberculosis, moderate.

RABBITS INJECTED WITH THE VIRUS H. 16. "J.H."

I.—Tissue Emulsions.†

Source of Material used for Injection.	Number of Rabbit.	Estimated dose of Tubercle Bacilli.	Killed or Died.	Duration of Life in Days.	Result.
Calf 273 .. ... (*Prescapular gland.*)	39	153,000	Died	61	General tuberculosis.
Calf 355 ... ... (*Prescapular gland.*)	66	4,210,000	"	85	General tuberculosis.
	67	4,210,000	"	29 (Intravenous)	General tuberculosis.
Rat 28 (injected with culture derived from human knee joint.)	334	—	Killed	220	Slight tuberculosis of peritoneum and kidneys.
	335	—	"	220	Slight tuberculosis of peritoneum and lungs. Trace in one kidney.

† All injections were intraperitoneal except where otherwise mentioned.

II.—Cultures.

A.—Dose: 10 Milligrammes. *Intraperitoneal.*

——	Immediate Source of Culture.	Total Duration of Cultivation.	Number of Rabbit.	Weight in Grammes.	Killed or Died.	Duration of Life in Days.	Result.
—	Guinea-pig 609, from human knee.	14 months	173	2,770	Killed	95	Slight tuberculosis somewhat widely distributed.
2nd Passage ...	Calf 273	10 months	206	1,560	"	90	Slight tuberculosis of peritoneum. Few tubercles in lungs and kidneys.
3rd Passage ...	Calf 337	13 months	445	1,120	Died	11	General tuberculosis.
"	"	19 months	699	1,370	"	15	Early general tuberculosis.

RABBITS INJECTED WITH THE VIRUS H. 16. "J.H."—*continued.*

II.—CULTURES—*continued.*

A.—DOSE: 10 MILLIGRAMMES. *Intraperitoneal—continued.*

—	Immediate Source of Culture.	Total Duration of Cultivation.	Number of Rabbit.	Weight in Grammes.	Killed or Died.	Duration of Life in Days.	Result.
3rd Passage ...	Calf 355	19 months	670	1,500	Died	13	Early general tuberculosis.
„	„	„	671	1,300	„	19	General tuberculosis.
4th Passage ...	Calf 317	10 months	355	2,220	„	17	General tuberculosis.
5th Passage ...	Bull 423A	3 months	188	1,400	..	23	General tuberculosis.

B.—DOSE: 1 MILLIGRAMME. *Intraperitoneal.*

—	Immediate Source of Culture.	Total Duration of Cultivation.	Number of Rabbit.	Weight in Grammes.	Killed or Died.	Duration of Life in Days.	Result.
—	Guinea-pig 609, from human knee.	14 months	172	1,720	Killed	95	Slight tuberculosis of peritoneum. Four tubercles in lungs.
2nd Passage ...	Calf 273	10 months	205	1,670	„	90	Slight tuberculosis of peritoneum. Grey tubercles in lung and in one kidney.
3rd Passage ...	Calf 337	13 months	446	1,020	Died	18	Early tuberculosis. Death perhaps accelerated by psorospermosis.
..	„	19 months	700	1,320	..	28	General tuberculosis.
..	„	„	701	1,300	..	21	General tuberculosis.
„	Calf 355	„	672	1,450	„	23	General tuberculosis.
„	„	„	673	1,450	..	22	General tuberculosis.
4th Passage ...	Calf 317	10 months	356	1,020	..	24	General tuberculosis.
5th Passage ...	Bull 423A	3 months	187	1,400	..	28	General tuberculosis.

C.—DOSE: 0·1 MILLIGRAMME. *Intraperitoneal.*

—	Immediate Source of Culture.	Total Duration of Cultivation.	Number of Rabbit.	Weight in Grammes.	Killed or Died.	Duration of Life in Days.	Result.
—	Guinea-pig 609 from human knee.	14 months	171	2,070	Killed	95	Slight tuberculosis of peritoneum. Three tubercles in lungs.
2nd Passage ...	Calf 273	10 months	204	1,500	„	90	Some tubercles in omentum, a few in lungs. one or two in kidneys and liver.
3rd Passage ...	Calf 337	13 months	447	1,370	Died	28	General tuberculosis.
„	..	19 months	702	1,070	..	107	General tuberculosis. (*Injection subcutaneous.*)
4th Passage ...	Calf 317	10 months	357	810	..	26	General tuberculosis.
„	„	17½ months	756	1,160	..	25	General tuberculosis.
5th Passage ...	Bull 423A	3 months	186	1,380	..	60	General tuberculosis.

INJECTIONS OF RABBITS MADE TO DETERMINE WHETHER THE VIRUS, AFTER IT HAD GAINED VIRULENCE FOR THE OX, CONTAINED A STRAIN OF BACILLI, BELONGING TO GROUP II., AND CAPABLE OF BEING ISOLATED BY MEANS WHICH PROVED SUCCESSFUL IN SEPARATING AN ARTIFICIAL MIXTURE OF GROUPS I. AND II., NAMELY, GROWTH ON GLYCERIN MEDIA.

One hypothesis which may be entertained to account for the change of virulence for bovines and rabbits, which took place in the virus in the course of this series of experiments, is that in the original virus composed in the main of bacilli belonging to our Group II., there were a few bacilli belonging to our Group I.; too few, indeed, to make any appreciable difference at first, but capable of being increased in relative numbers by cultivation in the bodies of suitable animals.

Another hypothesis postulates the accidental entrance into the virus, at some stage of the experiment, of bacilli belonging to our Group I.

A third hypothesis is that there was a true modification of a bacillus of Group II. into one of Group I.

Combining the first two together, we can speak of the hypothesis of *a mixture of two distinct kinds of bacilli*, and the hypothesis of *true modification.*

Now, from an artificial mixture the virulent (for calves and rabbits) element had shown itself capable of being eliminated by repeated growth on glycerin media; not, however, with certainty (*see* report on Experiments with Mixed Viruses, page 345). Nevertheless, the experiment seemed worth trying with some of the strains obtained in the course of this modification experiment, because while only a positive result would be positive proof, a negative result would afford presumptive evidence on the other side. Accordingly several strains were tested in this way, but in no case was the virulence eliminated. The following tables will sufficiently explain themselves. The result of these experiments therefore was to give no support to the hypothesis that we were dealing with a mixture of bacilli.

CULTURE DERIVED FROM CALF 355, DIRECT. [3rd PASSAGE.]

Glycerin-Serum Series.

Culture 3 weeks old. Rabbits inoculated intraperitoneally.

—	Total Duration of Artificial Cultivation.	Medium on which Final Culture was Grown.	Dose in mg.	Number of Rabbit.	Killed or Died.	Duration of Life.	Result.
16th Culture (*After three generations on glycerin serum.*)	19 months	Pure serum	10·0	666	Died	9 days	Early general tuberculosis.
	,,	,,	10·0	667	,,	21 ,,	General tuberculosis.
	,,	,,	1·0	668	,,	29 ,,	General tuberculosis.
	,,	,,	1·0	669	,,	23 ,,	General tuberculosis.

Serum Series. [Controls.]

Culture 3 weeks old. Rabbits inoculated intraperitoneally.

16th culture on pure serum.	19 months	Pure serum	10·0	670	Died	13 days	Early general tuberculosis.
	,,	,,	10·0	671	,,	19 ,,	General tuberculosis.
	,,	,,	1·0	672	,,	23 ,,	General tuberculosis.
	,,	,,	1·0	673	,,	22 ,,	General tuberculosis.

CULTURE DERIVED FROM CALF 337, DIRECT. [3rd PASSAGE.]

Glycerin-Serum Series.

Culture 3 weeks old. Rabbits injected intraperitoneally.

17th culture (*After four generations on glycerin serum.*)	19 months	Pure serum	10·0	695	Died	12 days	Early general tuberculosis.
	,,	,,	1·0	696	,,	101 ,,	Severe tuberculosis of kidneys and lungs. Subcutaneous tumour. (Injection partly subcutaneous.)
	,,	,,	1·0	697	,,	24 ,,	General tuberculosis.
	,,	,,	0·1	698	,,	94 ,,	General tuberculosis. (Injection partly intracæcal.)

Serum Series. [Controls.]

Culture 3 weeks old. Rabbits injected intraperitoneally.

17th culture on pure serum.	19 months	Pure serum	10·0	699	Died	15 days	Early general tuberculosis.
	,,	,,	1·0	700	,,	,,	General tuberculosis.
	,,	,,	1·0	701	,,	,,	General tuberculosis.
	,,	,,	0·1	702	,,	,,	General tuberculosis. Injection subcutaneous.

CULTURE DERIVED FROM CALF 317, DIRECT. [4th PASSAGE.]

Glycerin-Serum Series.

Cultures 3 weeks old. Rabbits inoculated intraperitoneally.

On pure serum (*After three generations on glycerin-serum.*)	17½ months	Pure serum	10·0	751	Died	21 days	General tuberculosis. (Injection partly intracoecal.)
	,,	,,	10·0	752	,,	12 ,,	Early general tuberculosis.
	,,	,,	1·0	753	,,	15 ,,	General tuberculosis.
	,,	,,	0·1	754	,,	17 ,,	General tuberculosis.

CULTURE DERIVED FROM CALF 317, DIRECT [4TH PASSAGE]—*continued.*

Glycerin-Serum Series—*continued.*

Cultures 3 weeks old. Rabbits inoculated intraperitoneally.

—	Total duration of Artificial Cultivation.	Medium on which Final Culture was Grown.	Dose in mg.	Number of Rabbit.	Killed or Died.	Duration of Life.	Result.
4th generation on glycerin-serum.	17½ months	Glycerin-serum	10·0	747	Died	34 days	General tuberculosis.
	,,	,,	10·0	748	,,	17 ,,	General tuberculosis.
	,,	,,	1·0	749	,,	24 ,,	General tuberculosis.
	,,	,,	1·0	750	,,	15 ,,	General tuberculosis.

Serum Series. [Controls.]

Culture 3 weeks old. Rabbits inoculated intraperitoneally.

16th culture on pure serum.	17½ months	Pure serum	1·0	755	Died	6 days	Psorospermosis.
	,,	,,	0·1	756	,,	25 ,,	General tuberculosis.

MODIFICATION OF VIRULENCE OF THE VIRUS H. 17. "Sp.B."

The next series of experiments in which a change of virulence was observed had for its starting point the sputum collected during four months from many patients in a large hospital.

Now, our experiments have shown that tubercle bacilli possessing a high degree of virulence for the ox and rabbit may be obtained from the human lung in some of those cases where the primary seat of disease is in the mesenteric glands (*e.g.*, H. 32. "Y.W." and H. 59. "L.B."; compare also H. 49. "T.C."). It is therefore not impossible that sputum from an exceptional case of this kind may have got mixed with that from the other cases, and that we were dealing from the beginning with a mixture of bacilli some belonging to our Group II. and others to our Group I., the latter being at first in a very small minority. This possibility must be borne in mind, though, as the sequel will show, we were unable to obtain any confirmation of it, and indeed on the contrary some evidence against it.

The facts of this series of experiments are as follows. Four young calves, Nos. 161, 167, 169 and 171, were fed daily with sputum, Sundays excepted, one (161) for three and the others for four months. The former received in all about 21 litres of sputum, the latter about 31 litres each.

From one of these calves (No. 169) sprang the series of animal injections which resulted in a change of virulence of the virus.

The four original calves were killed at periods varying from 4 to 5½ months after the commencement of the feeding. At the post-mortem examinations of all these animals minimal lesions alone were found, consisting of a few small yellow points in the Peyer's patches of the small intestine, and some small calcareous foci in the mesenteric and posterior pharyngeal glands. Emulsions made from the affected glands both of Calves 161 and 169, and injected into rabbits, failed to produce general tuberculosis. It is therefore almost certain that no tubercle bacilli of the kind belonging to the human Group I. were present in the tuberculous lesions of these calves, for even very minute doses of these bacilli have been found to be capable of producing progressive tuberculosis in the rabbit.

An emulsion of the affected glands of Calf 161 was injected subcutaneously into Calves 227 and 265. Tubercle bacilli were very scanty in this emulsion and the dose received by these animals was estimated to contain only 43,000 and 49,000 respectively. When the animals were killed 4 months later minimal lesions were found in one and no lesions at all in the other. A strain of culture was raised from one of them, No. 265, and was injected subcutaneously in 50 mg. doses into Calves 583 and 601, without causing anything more than minimal lesions.

From No. 171, another of the calves fed with tuberculous sputum, an emulsion was made of the affected glands, and injected subcutaneously into Calf 277. Tubercle bacilli were scanty and the dose was estimated to contain 76,000 only. It caused only minimal lesions.

An emulsion made from the lesions of this calf and injected subcutaneously into another, No. 341, in a dose containing 700,000 bacilli, also produced minimal lesions. Thus no modification was obtained in these two series of injections into calves.

So far the number of tubercle bacilli in the doses of tissue emulsion used in this experiment had been very small, and it was obviously desirable to inject larger numbers.

Accordingly, when Calf 167, the next of those fed with tuberculous sputum, was killed, the virus was passed through three guinea-pigs in succession, the first being injected with an emulsion of the mesenteric glands of Calf 167. From the third of these an emulsion was made, and a dose estimated to contain 4,500,000 tubercle bacilli was injected subcutaneously into Calf 391. Again only minimal lesions were produced, which in this case included some minute translucent foci in the lungs.

The virus from this calf was afterwards used for a succession of very young kids, but neither in these animals could progressive tuberculosis be produced. (*See* chart of experiment, Vol. VII of Appendix.)

We now come to Calf 169, the last of the sputum-fed animals, and the one from which a long series of injections descended.

When it was killed an emulsion was made of the affected glands, and the virus passed through two guinea-pigs in succession, in order to get a large number of tubercle bacilli. An emulsion of the last of these guinea-pigs was made and injected subcutaneously into Calf 339 in a dose estimated to contain 166,000,000 tubercle bacilli. It was killed 69 days later, and no tuberculous lesions were found beyond the prescapular gland.

A strain of culture was raised from this animal through Guinea-pig 1235. And of this 50 mg. injected subcutaneously into Calves 679 and 681 also produced minimal lesions.

Rabbits injected with an emulsion of the tuberculous organs of the same guinea-pig failed to develop progressive tuberculosis. It is therefore certain that at this stage of the experiment the virus belonged to the human Group II., for it had repeatedly failed to produce anything more than minimal lesions in the calf, even when very large doses, either of culture or tuberculous tissue, were used; and it is practically certain then that tubercle bacilli of the human Group I. were entirely absent, because in no case had a progressive tuberculosis developed in the rabbit.

From the guinea-pig infected from the prescapular gland of Calf 339 a long series of calves injected intravenously descends, six animals being thus dealt with in succession.*

The first of these, No. 475, is important. It was injected in the jugular vein with 20 cc. of an emulsion estimated to contain 104,000,000 tubercle bacilli—a large dose for intravenous injection. The temperature rose on the twelfth day after inoculation, and reached 41·8° C. on the eighteenth day. In the fifth week it fell to between 39° and 40° C., but never reached the normal. The animal was at one time ill, the respiration being somewhat severely affected. When the temperature fell the general health slowly improved; but the rate of growth remained very low, and an opacity appearing in the cornea of each eye, the animal gradually went blind.

It was killed 88 days after inoculation.

At the post-mortem examination each lung was found to contain a group of small cavities in the posterior corner occupying the last two or three inches. They were thin-walled, and contained thick tenacious pus. Calcareous grains were found adhering to their walls. Besides these were several dense caseous nodules very well defined, one being shaped like an egg and over an inch in length. There were in addition a few small fibrous tubercles. The bronchial and mediastinal glands were enlarged to about double their normal size; they were firmer than normal, and contained nodules full of caseous foci. Two small tubercles were found in the liver, and tubercles were found in the choroid of both eyes. There was nothing to indicate the seat of inoculation, the vein there being normal, but a deep cervical gland the size of a flattened pea was caseous, and one hyoid gland contained a caseating nodule. Tubercle bacilli were found in one orbital gland, and there were calcareous foci in the peribronchial glands. The rest of the animal was healthy.

The softening in the caseous nodules in the lungs was unusual, not having been seen before in our experimental animals; and this raised the question whether so advanced a lesion could have been produced within the 88 days which elapsed between injection and death, and whether it might not have been a spontaneous antecedent lesion.

The rabbits injected at the same time and with the same emulsion as this calf developed only minimal lesions.

An emulsion was made from the lung of Calf 475 and injected intravenously into Calf 539, in a dose estimated to contain 209,000,000 tubercle bacilli, and also into two rabbits, 169 and 170. The calf was killed 18 days later when in a dying condition, and was found to have acute tuberculous consolidation of the lungs. The rabbits which were injected, one intraperitoneally and the other intravenously, died in a few weeks of general tuberculosis. The doses were very large, being 459,000,000 and 41,750,000 respectively.

An emulsion was made of the lung of this calf and injected intravenously into Calf 529, the dose being estimated to contain 1,021,000,000 bacilli, and intraperitoneally into Rabbits 180 and 181, dose 817,000,000 and 1,226,000,000 respectively.

The calf died in 13 days of consolidation of lung. Tubercle bacilli were found in all the organs commonly susceptible of tuberculosis. The rabbits also died of general tuberculosis in a little over 3 weeks, the doses having been extremely large.

The next Calf, No. 553, was injected intravenously with an emulsion made from the lung of the preceding calf, the dose being estimated to contain 99,000,000 tubercle bacilli. Rabbits were also inoculated intraperitoneally, the dose being the same as that given to the calf.

The calf was in a dying condition when killed 18 days after injection. It had tuberculous endocarditis, tuberculous consolidation of lungs, numerous miliary tubercles in the liver, and numerous tubercle bacilli in the spleen. The rabbits died of general tuberculosis within 4 to 5 weeks.

After this the series of intravenous injections was still continued, but it was thought desirable to test the virulence of the virus at this stage by injecting calves subcutaneously. Consequently with the emulsion made from the thoracic glands of the preceding calf not only was a calf injected intravenously, and two rabbits intraperitoneally as before, but in addition two calves, 531 and 555, were injected subcutaneously. It will be convenient to consider these two animals first.

The dose, 150,000,000 bacilli, was chosen to correspond nearly with that given to Calf 339, the animal which precedes the intravenous calves in the series, and which failed to develop any lesions beyond the prescapular gland. No. 555 died of general tuberculosis 58 days after injection, and No. 531 was in a dying condition when killed on the following day The virus was thereby proved to have become highly virulent for calves. The rabbits also, which received a dose of 11,000,000 bacilli, died of general tuberculosis within five weeks.

To return to the intravenous series. At the same time that the two calves just described were injected subcutaneously, Calf 557 was injected intravenously with the same emulsion, the dose being estimated to contain 49,000,000 bacilli. The animal was killed when dying 17 days later. There was the usual tuberculous consolidation of lungs, and tubercle bacilli in other organs.

An emulsion was made of the thoracic glands of this animal and injected into the veins of Calf 571, the last of the intravenous series, and into rabbits 210 and 211. The dose given to the calf was considerably smaller than that hitherto used. It was estimated to contain 10,000,00 tubercle bacilli. The animal died in 26 days, with the usual tuberculous consolidation affecting the greater part of the lungs, and with miliary tuberculosis elsewhere. As the number of bacilli injected was less than that in the preceding animals the tubercles also were less numerous, and since the animal had lived a little longer they were rather larger in size. The rabbits, which had received 5,000,000 tubercle bacilli each, developed a somewhat slowly progressing tuberculosis. No. 210, which had inadvertently been injected into the abdominal wall instead of into the peritoneum, died of severe tuberculosis of lungs 87 days after inoculation. This in itself would perhaps not be worth mentioning, seeing that subcutaneous injection in the rabbit always produces a far less rapidly fatal tuberculosis than intraperitoneal injection does. The other rabbit, however, which was injected in the peritoneum, lived 100 days. There is no note in the post-mortem record indicating that any accident had occurred, such as injection partly into the cæcum. The rabbit was found to have slight tuberculous peritonitis and severe tuberculosis of lungs and kidneys.

There is another fact which shows perhaps that the virulence of the virus at this its final stage was perhaps a little less than that of the viruses of Group I. A young bull, No. 611, about seven months old (weight 2 cwt. 3 qrs. 3 lbs.) was subcutaneously injected with an emulsion of left bronchial gland from Calf 531 with a dose estimated to contain 122,000,000 tubercle bacilli.

This animal, after developing a swelling at the seat of injection, and being more or less indisposed, apparently recovered, and grew to be a fine strong bull. Fourteen and a half months after injection it gave a very good reaction to tuberculin, although it appeared to have nothing the matter with it.

It was killed eighteen months after injection, and was found to be in very good general condition, but there were many yellow calcareous and caseous tubercles in the lungs, some collected together in collapsed lobules, and there was one lobule which appeared to be affected by quite recent tuberculous broncho-pneumonia. Most of the lymphatic glands of the body contained rather large calcareous tubercles.

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* It had already been found that the ox might be killed with bacilli belonging to Group II. if these were injected intravenously and in large enough doses. For these bacilli can produce local lesions at the seat of inoculation, and in the case of intravenous injections the local lesions are in the lungs, and if these are sufficiently numerous they may prove fatal. Intravenous injection therefore seemed a favourable method of growing bacilli of Group II. in the ox.

The significance of this result can only be ascertained by comparing it with others produced by bacilli of Group I. injected into young adult animals. Since the influence of dose is considerable, comparison is only useful when doses are approximately equal. Two animals may be cited for comparison.

Cow 63, H. 2. "Sp.A," received 158,000,000 bacilli injected subcutaneously, and died of general tuberculosis 45 days later. Heifer 197, H. 14. "F.S." received 85,000,000 bacilli, and was killed when ill 51 days later, and was found to have general tuberculosis. On the other hand, Heifer 251 received a very much larger dose, namely, 2,800,000,000 tubercle bacilli of the virus H. 29. "M.F." was killed when apparently well 138 days later, and was found to have tuberculosis, general indeed, but not severe. And Heifers 233 and 247 received 53,440,000 tubercle bacilli, and were not at all severely affected when killed 180 days afterwards. These facts lead one to regard the recovery of Bull 611 not as evidence of the failure of the virus at that stage to reach the standard of virulence of Group I., but rather as another example of the occasionally great resisting power of the older animals of the species.

CULTURE INJECTIONS.

In order to have a more exact idea of the virulence of this virus at the various stages of its modification, cultures were obtained from various animals of the series and tested by the injection of standard doses into calves and rabbits. Since there is evidence that the virulence of some of these strains was unstable under the conditions of artificial cultivation, the age of each strain (total duration of artificial cultivation) at the time its virulence was first tested is stated. The actual cultures which yielded the bacilli injected were in every case three weeks old.

Four strains of culture were tested, namely :—

No. 1. Obtained from Guinea-pig 1235, which had been injected with an emulsion of the prescapular gland of Calf 339, and which stands at the head of the series of calves injected intravenously.

No. 2. Obtained from Rabbit 181, injected with an emulsion from the second intravenous Calf No. 539.

No. 3. Obtained from the fourth intravenous Calf No. 553, through a guinea-pig.

No. 4. Obtained directly from the sixth intravenous Calf No. 571.

One would have liked to have used a culture from the first intravenous Calf No. 475, but unfortunately this was not obtained.

The total duration of cultivation of the four strains when tested was as follows :—

No. 1. 8 months.
No. 2. 10 months, 16 months, and 19½ months.
No. 3. 3 months.
No. 4. 3½ months.

These strains of culture were injected subcutaneously into calves and rabbits. Each strain, except No. 3, was injected in 50 milligramme doses into two calves. No 3 was injected in a dose of 50 milligrammes into one calf only, but it was also injected into two others in doses of 10 milligrammes.

The result of these injections was as follows :—

No. 1 (1st passage). Produced in Calves 679 and 681 no more than minimal lesions, which did not extend beyond the glands nearest the seat of injection.

Strain No. 2 (3rd passage), namely, that from Rabbit 181, had existed 10 months under artificial cultivation when injected into Calves 891 and 911. It produced a general tuberculosis, which, however, was not so rapidly fatal as that usually produced by viruses of Group I. Indeed both animals lived somewhat longer than any other of the calves injected with 50 milligrammes of the viruses of Group I., two alone excepted. Thus the virulence at this stage, though undoubtedly high for the calf, is not quite up to the standard of a Group I. virus. (*See* diagram representing the duration of life of calves injected with 50 milligrammes of culture of viruses of Group I. in Appendix to 2nd Interim Report Vol. II, page 1029.)

The rabbits injected with this strain support this conclusion, though somewhat feebly. One which received 10 milligrammes died in 23 days, which is not an extreme period for an animal injected with this dose of a virus of Group I. Another injected with 1 milligramme, however, survived for 49 days, a period which is almost unknown with this dose, and which is much above the average.

Strain No. 3 (5th passage) was injected into Calf 897, 50 milligrammes, and Calves 901 and 909, 10 milligrammes.

The 50-milligramme animal died of general tuberculosis in 32 days, a period which is less than the average for calves injected with viruses of Group I. The 10-milligramme calves both died of general tuberculosis in 54 and 31 days respectively, which is well within the average for this dose. Rabbits injected with the same culture died in the usual time of general tuberculosis.

Strain No. 4 (7th passage), namely, that from the last calf of the intravenous series, was injected into two calves, 739 and 743, in 50-milligramme doses. Both developed acute general tuberculosis and were killed in a dying condition, the one 33 and the other 37 days after injection.

Rabbits injected with the same culture died of general tuberculosis.

From the calves injected with these cultures therefore we may draw the conclusion that the strain which was originally incapable of setting up a progressive tuberculosis, or indeed anything more than a minimal local tuberculosis, in calves, became after passing successively through four of these animals intravenously injected, as virulent for bovines as the viruses of human Group I. Further passage through bovines served only to maintain this degree of virulence.

The full virulence, however, does not appear to have been reached suddenly. The virus from Rabbit 181, which had been injected from the second intravenous calf, though highly virulent for calves, was not quite up to the standard of virulence of Group I. viruses.

The rabbits inoculated with culture confirm the conclusion already drawn from the fate of the calves, namely, that the strain derived from Calf 553 and subsequent animals was fully virulent, while that derived from Rabbit 181 was of distinctly less virulence.

This strain of tubercle bacilli derived from Rabbit 181 is of great importance. We have seen that it proved itself virulent for both calves and rabbits, but that its virulence fell a little short of the standard of Group I.

Subsequently, as will now be described, its virulence was found to be unstable.

At the time when the first tests were made with this strain it had been growing for 10 months in artificial culture, always on bovine serum (without addition of glycerin).

When the strain had been growing in artificial cultivation for 16 months its virulence was again tested. As large and small colonies had appeared on a glycerin serum tube, a strain was raised from each of these on pure serum, and injected into rabbits. At the same time control injections were made with the strain which had always been kept on pure serum. All these proved to have the low degree of virulence for the rabbit characteristic of our Group II.

This loss of virulence was confirmed on the ox and rabbit when the strain had been growing for 19½ months in artificial cultivation on pure serum. Two calves Nos. 1083 and 1103, were injected subcutaneously with 100 and 30 milligrammes of bacilli respectively, and 4 rabbits intraperitoneally, two with 10, and two with 1, milligrammes of bacilli.

These animals remained well for nearly 3 months, and the resulting lesions were minimal.

These results may be summarised as follows :—

The rabbit from which the strain was raised, No. 181, and its fellow 180, had died in the short period of 22 and 25 days respectively, and the calf injected with the same virus had also died very rapidly. Thus there is no reason to think that the virulence of the strain at this period was anything less than the standard of Group I., though the fact that large doses were used prevents us from being certain that it was fully up to this standard. After 10 months of artificial cultivation on pure serum the virulence was still high, though slightly less than the standard of Group I.; and 6 months later still it had fallen to the standard of a Group II. virus, and was no longer capable of producing a progressive tuberculosis in rabbits. Shortly after it was proved to have a low degree of virulence for the calf.

Thus the newly-acquired virulence of this virus, shown by the strain from Rabbit 181, *was unstable, and proved capable of modification in both directions; when first tested it was not quite up to the standard of Group I.; but it fully attained this standard after passing through another calf. On the other hand, under the conditions of artificial culture on pure serum, the virulence, such as it possessed, became degraded to the standard of Group II.* As will be seen in the sequel, another strain belonging to one of the viruses concerned in a modification experiment (H. 49. "T.C.") behaved in precisely the same way. This is not inconsistent with the hypothesis that we were dealing with a mixture.

Finally, a few words may be said about the cultural characters of these and other strains in the "Sp.B" series.

All those strains which were derived from animals infected with the virus before it had acquired virulence for calves and rabbits grew luxuriantly upon glycerin media, and were, according to our nomenclature, eugonic. These strains were derived from Calf 265 direct, and from Calf 339, through Guinea-pig 1235.

The strains derived from the calves injected with the virus after it had acquired full bovine virulence grew badly upon glycerin media. They were as follows:—

From Calf 553 (5th Passage) through Guinea-pig 1542.
„ Calf 571 (7th „) direct.

The culture from Rabbit 181 grew well upon glycerin media, and may on the whole be described as eugonic.

In reviewing this large and complicated experiment, two facts stand out prominently; firstly, that starting with a virus which was a typical member of the human Group II., and which, as the rabbits infected with it show, could not have contained even a few stray bacilli of the human Group I., one ended with a virus which was a typical member of Group I., and was identical with other members of this group, both in cultural characters and in virulence, this change being brought about during the course of a series of injections from animal to animal. Secondly that from somewhere in the middle of this series a strain of bacilli was obtained which may or may not have been when freshly isolated fully as virulent as members of Group I., but which certainly fell a little short of this standard after it had been 10 months in cultivation, and which a little later had lost its virulence altogether for the ox and rabbit.

In this respect the "Sp.B." experiment falls into line with the preceding one with H. 16. "J.H.", and as we shall see with the succeeding experiments with H. 13, "A.D." and H. 49, "T.C."

CALVES AND GOATS INJECTED WITH THE VIRUS H. 17. "Sp.B."

I.—Tissue Emulsions.

—	Number of Animal.	Mode of Injection.	Estimated dose of Tubercle Bacilli.	Fate of Animal and Condition at Death.	Amount and Range of Tuberculous Lesions at Death.
			FOUR ORIGINAL CALVES FED WITH SPUTUM.		
—	Calf 161	Feeding	—	Killed when well after 125 days.	Slight tuberculosis of intestine, mesenteric and pharyngeal glands.
—	Calf 167	„	—	Killed when well after 168 days.	Slight tuberculosis of intestine, mesenteric and pharyngeal glands.
—	Calf 171	„	—	Killed when well after 154 days.	Slight tuberculosis of intestine, mesenteric and pharyngeal glands.
—	Calf 169	„	—	Killed when well after 169 days.	Slight tuberculosis of intestine, mesenteric and pharyngeal glands.
			(1) ANIMALS INJECTED WITH THE VIRUS DESCENDED FROM CALF 161.		
1st Passage ...	Calf 227	S.	43,329	Killed when well after 114 days.	Normal throughout.
„	Calf 265	S.	49,995	Killed when well after 107 days.	Slight tuberculosis.
			(2) ANIMALS INJECTED WITH THE VIRUS DESCENDED FROM CALF 167.		
1st Passage ...	Calf 391	S.	41,600,000	Killed when well after 40 days.	Slight tuberculosis.
2nd Passage...	Goat 37	S.	102,340,000	Killed when well after 231 days.	Slight tuberculosis.
„	Goat 39	S.	102,340,000	Killed when well after 92 days.	Slight tuberculosis.
3rd Passage...	Goat 43	S.	4,269,000	Killed when well after 137 days.	Slight tuberculosis.
„	Goat 45	V.	1,067,000	Killed when well after 137 days.	Local tuberculosis.
			(3) ANIMALS INJECTED WITH THE VIRUS DESCENDED FROM CALF 171.		
1st Passage ...	Calf 277	S.	76,002	Killed when well after 89 days.	Slight tuberculosis.
2nd Passage...	Calf 341	S.	700,000	Killed when well after 70 days.	Local tuberculosis.

S = Subcutaneous. V = Intravenous.

CALVES AND GOATS INJECTED WITH THE VIRUS H. 17. "Sp.B."—*continued.*

I.—TISSUE EMULSIONS—*continued.*

——	Number of Animal.	Mode of Injection.	Estimated dose of Tubercle Bacilli.	Fate of Animal and Condition at Death.	Amount and Range of Tuberculous Lesions at Death.
(4) ANIMALS INJECTED WITH THE VIRUS DESCENDED FROM CALF 169.					
1st Passage ...	Calf 339	S.	165,853,000	Killed when well after 69 days.	Local tuberculosis.
2nd Passage...	Calf 475	V.	104,240,000	Killed when well after 88 days.	General tuberculosis, slight.
3rd Passage...	Calf 539	V.	208,700,000	Killed when dying after 18 days.	General tuberculosis.
4th Passage...	Calf 529	V.	1,021,200,000	Died after 13 days	General tuberculosis.
5th Passage...	Calf 553	V.	99,000,000	Killed when dying after 18 days.	General tuberculosis.
6th Passage...	Calf 557	V.	48,919,000	Killed when dying after 17 days.	General tuberculosis.
,,	Calf 555	S.	150,520,000	Died after 58 days	General tuberculosis, severe.
,,	Calf 531	S.	150,520,000	Killed when dying after 59 days.	General tuberculosis, severe.
7th Passage...	Calf 571	V.	10,000,000	Died after 26 days	General tuberculosis.
,,	Bull 611	S.	122,400,000	Killed when well after 571 days.	General tuberculosis, slight and not very obviously progressive.

S = Subcutaneous. V = Intravenous.

RABBITS INOCULATED† WITH THE VIRUS H. 17. "Sp.B."

I.—Tissue Emulsions.

Source of Material used for Injection.	Number of Rabbit.	Estimated dose of Tubercle Bacilli.	Killed or Died.	Duration of Life in Days.	Result.
Calf 161 ... ... (*Mesenteric and pharyngeal glands.*)	11	—	Killed	175	No tuberculosis.
,, ,,	12	—	,,	175 (Subcutaneous.)	No tuberculosis.
Calf 171 ... ... (*Mesenteric glands.*)	17	—	Died	5	No tuberculosis. Death due to psorospermosis.
,, ,,	18	—	,,	16 (Subcutaneous.)	No tuberculosis. Cause of death unknown.
Calf 277 ... ... (*Prescapular gland.*)	52	52,500	Killed	95	Few tubercles in omentum and lungs.
Guinea-pigs 1132-1133 (third series from Calf 167).	76	4,160,000	,,	130	Slight tuberculosis of kidneys and mammary gland.
,, ,,	77	4,160,000	,,	130 (Intravenous.)	One tubercle in each lung.
Calf 391 ... ... (*Local lesion and prescapular gland.*)	89	13,645,000	,,	93 (Intravenous.)	Slight tuberculous pyelitis of left kidney.
,, ,,	90	13,645,000	,,	93	One tubercle in lung.
Kid 39 ... ... (*Prescapular gland.*)	127	427,000	Died	66 (Intravenous.)	No tuberculosis.
,, ,,	128	2,134,000	Killed	119	Normal except that the injected material was encysted in peritoneum.
Calf 169 ... ... (*Mesenteric glands.*)	26	—	Died	11	Slight tuberculosis of peritoneum. Tuberculous abscess in peritoneum, ? cause of death.
,, ,,	27	—	Killed	170 (Subcutaneous.)	Few minute tubercles in lungs.
Guinea-pig 1235, from Calf 339.	108	20,848,000	,,	77	Slight tuberculosis of peritoneum. Some translucent tubercles in lungs, few in kidneys.
,, ,,	109	10,424,000	,,	77 (Intravenous.)	A few minute grey tubercles in lung, liver, and kidneys.
Calf 685. (Inoculated with culture from Calf 339.)	380	—	,,	191	No tuberculosis.

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† All injections were intraperitoneal, except where otherwise mentioned.

RABBITS INOCULATED† WITH THE VIRUS H. 17. "Sp.B."—*continued.*

I.—TISSUE EMULSIONS—*continued.*

Source of Material used for Injection.	Number of Rabbit.	Estimated dose of Tubercle Bacilli.	Killed or Died.	Duration of Life in Days.	Result.
Calf 475 ... ... (*Lung.*)	169	459,140,000	Died	33	General tuberculosis, acute.
" "	170	41,740,000	"	30 (Intravenous.)	General tuberculosis.
Calf 539 ... ... (*Lung.*)	180	816,960,000	"	25	General tuberculosis.
" "	181	1,225,440,000	"	22	General tuberculosis; very early in lungs, kidneys not affected.
Calf 529 ... ... (*Thoracic glands.*)	189	99,000,000	"	31	General tuberculosis.
" "	190	99,000,000	"	34	General tuberculosis.
Calf 553 ... ... (*Thoracic glands.*)	196	11,289,000	"	34	General tuberculosis.
" "	197	11,289,000	"	34	General tuberculosis.
Calf 557 ... ... (*Lung.*)	210	5,000,000	"	87 (Subcutaneous.)	Severe tuberculosis of lungs.
" "	211	5,000,000	"	100	Slight tuberculosis of peritoneum. Severe tuberculosis of lungs and kidneys.

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† All injections were intraperitoneal, except where otherwise mentioned.

CALVES INJECTED WITH THE VIRUS H. 17. "Sp.B."

II.—Cultures.

Subcutaneous Injections.

—	Immediate Source of Culture.	Total Duration of Cultivation.	Number of Calf.	Weight in Kilos.	Fate of Animal, and Condition at Death.	Amount and Range of Tuberculous Lesions at Death.
			A. DOSE: 50 MILLIGRAMMES.			
[Strain derived from Calf 161.]	Calf 265 ...	10 months	583	50·80	Killed when well after 90 days.	Local tuberculosis.
"	"	"	601	52·61	Killed when well after 90 days.	Slight tuberculosis.
1st Passage ... [Strain derived from Calf 169.]	Guinea-pig 1235, from Calf 339.	8 months	679	57·60	Killed when well after 91 days.	Local tuberculosis.
"	"	"	681	60·32	Killed when well after 91 days.	Local tuberculosis.
3rd Passage ...	Rabbit 181, from Calf 539.	10 months	891	46·25	Died after 48 days	General tuberculosis, moderate.
"	"	"	911	55·34	Died after 58 days	General tuberculosis, severe.
5th Passage ...	Guinea-pig 1542, from Calf 553.	3 months	897	48·50	Died after 32 days	General tuberculosis, severe.
7th Passage ...	Calf 571 ...	3½ months	739	39·46	Dying after 33 days	General tuberculosis, severe.
"	"	"	743	38·10	Dying after 37 days	General tuberculosis, severe.
			B. DOSE: 10 MILLIGRAMMES.			
5th Passage ... [Strain derived from Calf 169.]	Guinea-pig 1542 from Calf 553.	3 months	901	50·34	Died after 54 days	General tuberculosis, severe.
"	"	"	919	45·80	Died after 31 days	General tuberculosis, severe.

RABBITS INJECTED WITH THE VIRUS H. 17. "Sp.B."

II.—Cultures.

(*a*) Strain derived from Calf 169.

A.—Dose: 50 Milligrammes. *Intraperitoneal.*

	Immediate Source of Culture.	Total Duration of Cultivation.	Number of Rabbit.	Weight in Grammes.	Killed or Died.	Duration of Life in Days.	Result.
1st Passage	Guinea-pig 1235, from Calf 339.	8 months	265	1,230	Died	73	Trace of tuberculosis in one kidney. Death from non-tuberculous pneumonia.
3rd Passage	—	—	—	—	—	—	—
5th Passage	—	—	—	—	—	—	—
7th Passage	—	—	—	—	—	—	—

B.—Dose: 10 Milligrammes. *Intraperitoneal.*

	Immediate Source of Culture.	Total Duration of Cultivation.	Number of Rabbit.	Weight in Grammes.	Killed or Died.	Duration of Life in Days.	Result.
1st Passage	Guinea-pig 1235, from Calf 339.	8 months	266	1,190	Killed	91	Very slight tuberculosis of peritoneum. Few tubercles in lungs and left kidney.
3rd Passage	Rabbit 181, from Calf 539.	10 months	595	1,190	Died	23	General tuberculosis.
5th Passage	Guinea-pig 1542, from Calf 553.	3 months	599	2,830	,,	13	Early general tuberculosis. (?) Cause of death.
7th Passage	Calf 571.	3½ months	364	820	,,	16	General tuberculosis.

C.—Dose: 1 Milligramme. *Intraperitoneal.*

	Immediate Source of Culture.	Total Duration of Cultivation.	Number of Rabbit.	Weight in Grammes.	Killed or Died.	Duration of Life in Days.	Result.
1st Passage	Guinea-pig 1235, from Calf 339.	8 months	267	1,230	Killed	91	Slight tuberculosis of peritoneum and lungs.
3rd Passage	Rabbit 181, from Calf 539.	10 months	596	1,220	Died	49	General tuberculosis.
,,	,,	,,	597	1,210	,,	65	General tuberculosis. (Injection partly intramuscular.)
5th Passage	Guinea-pig 1542, from Calf 553.	3 months	600	1,560	,,	19	General tuberculosis.
,,	,,	,,	601	1,310	,,	81	General tuberculosis. (Injection partly intramuscular.)
7th Passage	Calf 571	3½ months	365	600	,,	23	General tuberculosis.

D.—Dose: 0·1 Milligramme. *Intraperitoneal.*

	Immediate Source of Culture.	Total Duration of Cultivation.	Number of Rabbit.	Weight in Grammes.	Killed or Died.	Duration of Life in Days.	Result.
1st Passage	—	—	—	—	—	—	—
3rd Passage	Rabbit 181, from Calf 539.	10 months	598	1,020	Died	29	Early tuberculosis complicated by cysticercosis.
5th Passage	Guinea-pig 1542, from Calf 553.	3 months	602	1,360	,,	119	General tuberculosis. (Injection intracæcal.)
7th Passage	Calf 571	3½ months	366	660	,,	37	General tuberculosis.

E.—Dose: 0·01 Milligramme. *Intraperitoneal.*

	Immediate Source of Culture.	Total Duration of Cultivation.	Number of Rabbit.	Weight in Grammes.	Killed or Died.	Duration of Life in Days.	Result.
1st Passage	—	—	—	—	—	—	—
3rd Passage	—	—	—	—	—	—	—
5th Passage	—	—	—	—	—	—	—
7th Passage	Calf 571	3½ months	367	750	Died	40	General tuberculosis.

RABBITS INJECTED WITH THE VIRUS H. 17. "Sp.B."—*continued.*

II.—CULTURES—*continued.*

(*b*) Strain derived from Calf 161.

Immediate Source of Culture.	Total Duration of Cultivation.	Dose in Milligrammes.	No. of Rabbit.	Weight in Grammes.	Killed or Died.	Duration of Life.	Result.
Calf 265 Injected with emulsion of lesions from Calf 161.	10 months	10·0	**232**	2,260	Killed	90 days	Slight tuberculosis of peritoneum and kidneys. A trace in lungs.
..	,,	1·0	**231**	2,130	,,	90 days	Slight tuberculosis of peritoneum, lungs, and kidneys.
..	,,	0·1	**230**	1,930	,,	90 days	Trace of tuberculosis in peritoneum and lungs.

TABLES SHOWING LOSS OF VIRULENCE FOR CALVES AND RABBITS OF THE STRAIN OF CULTURE DERIVED FROM CALF 539 [3rd PASSAGE] THROUGH RABBIT 181, AFTER GROWTH FOR MANY GENERATIONS ON ARTIFICIAL MEDIA.

Culture Medium used: Pure Bovine Serum only.

A.—CALVES.

Total Duration of Cultivation.	Number of Calf.	Weight in Kilos.	Dose in Milligrammes.	Fate of Animal and Condition at Death.	Amount and Range of Tuberculous Lesions at Death.
			(*a*) BEFORE LOSS OF VIRULENCE.		
10 months ...	**891**	46·25	50 mg.	Died after 48 days	General tuberculosis, moderate.
	911	55·34	50 mg.	Died after 58 days	General tuberculosis, severe.
			(*b*) AFTER LOSS OF VIRULENCE.		
19½ months ...	**1083**	48·95	100 mg.	Killed when well after 81 days.	Slight tuberculosis.
	1103	37·64	30 mg.	Killed when well after 82 days.	Local tuberculosis.

B.—RABBITS.

Total Duration of Cultivation.	Number of Rabbit.	Weight in Grammes.	Dose in mg.	Killed or Died.	Duration of Life.	Result.
			(*a*) BEFORE LOSS OF VIRULENCE.			
10 months ...	**595**	1,190	10·0	Died	23 days	General tuberculosis.
	596	1,220	1·0	,,	49 days	General tuberculosis.
			(*b*) AFTER LOSS OF VIRULENCE.			
16 months ...	**804**	1,270	1·0	Killed	52 days	Slight chronic tuberculosis of peritoneum and lungs. Uterus filled with tuberculous deposit.
	805	1,380	1·0	,,	92 days	Slight tuberculosis of peritoneum, lungs, and kidneys; very retrogressive in the former.
16½ months ...	**828**	900	1·0	,,	37 days	Slight chronic tuberculosis of peritoneum, lungs and kidneys. (Injection partly intracæcal.)
	829	920	0·1	,,	145 days	Trace of tuberculosis in peritoneum only.
19½ months ...	**924**	1,400	10·0	,,	82 days	Slight tuberculosis of peritoneum and lungs.
	925	1,420	10·0	,,	82 days	Local lesion; slight tuberculosis of lungs. (Injection subcutaneous.)
	926	1,310	1·0	,,	82 days	Slight tuberculosis of peritoneum, lungs, kidneys, and uterus.
	927	1,250	1·0	,,	82 days	Slight tuberculosis of peritoneum, lungs, kidneys, and uterus.

INJECTIONS OF RABBITS; MADE TO DETERMINE WHETHER THE VIRUS CONTAINS A STRAIN OF BACILLI, BELONGING TO GROUP II., AND CAPABLE OF BEING ISOLATED BY RAISING STRAINS FROM SINGLE COLONIES; BUT SHOWING INSTEAD A LOSS OF VIRULENCE OF THE STRAIN EVEN WHEN GROWN CONTINUOUSLY ON PURE SERUM.

CULTURE DERIVED FROM CALF 539 [THIRD PASSAGE], THROUGH RABBIT 181.

Separation of Colonies on a Glycerin-Serum Medium.

Cultures 3 weeks old. Rabbits inoculated intraperitoneally.

Generation and Source of Culture.	Length of time during which the strain has been in artificial cultivation.	Medium on which final culture was grown.	Dose in Milli-grammes.	Number of Rabbit.	Killed or Died.	Duration of Life.	Result.
Culture derived from *large wrinkled colony* on a glycerin-serum tube of 28-11-05.	15½ months	Pure serum	10·0	795	Died	95 days	Chronic progressive tuberculosis.
			10·0	796	Killed	166 days	Slight tuberculous peritonitis. Chronic tuberculosis of lungs and kidneys, the former rather severe.
			1·0	797	,,	166 days	Slight tuberculosis of peritoneum and kidneys.
			1·0	798	,,	166 days	Slight tuberculosis of peritoneum and kidneys. (Injection partly subcutaneous.)
,, ,,	16 months	Pure serum	10·0	800	Killed	92 days	Chronic fibrous tuberculosis of peritoneum, lungs, and kidneys.
			10·0	801	Died	36 days	Slight tuberculous peritonitis. Tuberculosis of lung. Trace in kidneys.
			1·0	802	Killed	92 days	Abscess at seat of inoculation. A few fibrous tubercles in lungs. Injection intramuscular.
			1·0	803	,,	92 days	Slight tuberculosis of lungs and peritoneum. Trace in kidneys.
Culture derived from *small colony* on a glycerin-serum tube of 28-11-05.	16½ months	Pure serum	1·0	828	,,	37 days	Slight chronic tuberculosis of peritoneum, lungs, and kidneys. (Injection partly intracæcal.)
			0·1	829	,,	145 days	Trace of tuberculosis in peritoneum only.

Serum Series. [Controls.]

Culture 3 weeks old. Rabbits inoculated intraperitoneally.

10th generation of culture on pure serum.	16 months	Pure serum	1·0	804	Killed	52 days	Slight chronic tuberculosis of peritoneum and lungs. Uterus filled with tuberculous deposit.
			1·0	805	,,	92 days	Slight tuberculosis in peritoneum, lungs, and kidneys; very retrogressive in the former.

MODIFICATION OF THE VIRULENCE OF THE VIRUS H. 13. "A.D."

The third instance of apparent modification occurred in the case of Virus H. 13. "A.D." This came from a male child, aged four years, who died on June 6, 1903, of meningitis and miliary tuberculosis, affecting the lungs, liver, and spleen. The mesenteric glands were normal, but the bronchial glands were caseous, and were almost certainly the seat of the oldest lesion which was found after death. The largest, which measured 1 by ¾ in., contained caseating nodules, one of which had already broken down into grey purulent matter. Two other bronchial glands, which were whitish, opaque, and rather dense, contained caseating foci. There were numerous tubercle bacilli seen in a preparation from one of these glands. An emulsion was made from the gland most affected, and from the most affected portions of the two other bronchial glands, and since this did not seem sufficient for the purpose there was added two or three grammes of spleen. It was not very rich in tubercle bacilli, only 1,600 tubercle bacilli per cubic centimetre being estimated.

Two calves, Nos. 119 and 129, were injected subcutaneously with 10 cc. of this emulsion, on June 7, 1903. The estimated dose, 16,000 bacilli, has been shown by other experiments to be too small to produce general tuberculosis with certainty in the calf, even if the virus be virulent for this species of animal (*see* Appendix to 2nd Interim Report, Vol. II, page 1035). Therefore, the fact that in the cases now under consideration, minimal lesions, which did not spread beyond the nearest lymphatic glands, were found when the animals were killed some 9 or 10 weeks later, cannot be accepted as conclusive evidence that the virus was not virulent for the calf, and belonged to our Group II. Unfortunately, no rabbits were inoculated at this stage of the experiment

Another calf, however, was subcutaneously injected with a larger dose of bacilli contained in an emulsion made from the calcareous prescapular gland of Calf 119, the estimated number of bacilli injected in this case being about 3,500,000. The result was even less than in the former calves, for when the animal was killed 89 days later there was only a pea-sized calcareous nodule at the seat of inoculation, and no tuberculosis elsewhere.

Even in this case the dose was not large enough to be quite satisfactory. Nevertheless there has occurred no instance in our experience where a virus of Group I. has produced a local lesion only, however small the dose; and in many cases general tuberculosis has been caused by injection of far smaller quantities of tubercle bacilli than were used in this case. The nearest approach to this result which has been produced here by a virus of Group I. was afforded by Calf 223 (H. 20. "F.L."), in which a dose of 2,300,000 bacilli produced minimal calcareous lesions which did not spread beyond the nearest lymphatic glands. This calf, however, was nearly twice as large as No. 225.* It cannot be maintained that the virulence may have deteriorated while the virus was subsisting in a calcareous lesion in a resistant animal, for our experience here affords striking evidence to the contrary.†

It must therefore be held that the virus "A.D." at this stage had a low degree of virulence for the calf, and consequently that it belonged to our Group II. At a later stage it developed high virulence for this animal. The steps by which this modification occurred were as follows:

When Calf 129, one of the two animals injected with the emulsion of human tissue, was killed on August 12, 1903, the lesions found in it were so small that there was very little tuberculous material available for the injection of other animals. The virus was accordingly passed through guinea-pigs with the object of obtaining larger quantities of tubercle bacilli. Three sets of guinea-pigs were injected in succession, and from the tuberculous organs of the last of these an emulsion was made containing over 27,000,000 tubercle bacilli per cubic centimetre. This was injected in doses of 20 cc. (541,300,000 bacilli), into Calves 299 and 301.

In the case of No. 299 the injection was intraperitoneal. In spite of the size of the dose the animal remained well, and when killed 87 days after injection, the disease was found to be limited to the peritoneum and to a few lymphatic glands. It was nowhere severe, and none of the great organs were affected. Even allowing that this may have been a highly resistant individual, it is certain that the virus had not yet attained to the virulence of those belonging to our Group I.‡

The virus, however, at this stage had attained a virulence for the calf far in excess of that of a member of Group II, for the calf, No. 301, which was injected subcutaneously, developed severe miliary tuberculosis, and was very ill when killed 33 days after injection. A rabbit injected with the same emulsion died of general tuberculosis in 24 days.

In contrasting Calf 301 with No. 299, it seems probable that it had a very low degree of individual resisting power.

From the posterior thoracic gland of Calf 301, an emulsion rich in tubercle bacilli was made and injected subcutaneously into three calves.

No. 315 received a dose estimated to contain 15,000 bacilli, which was intended to be approximately the same, or a little smaller than that given to the original pair of calves. It produced only small lesions at the seat of inoculation and in the nearest lymphatic glands, and although there were one or two minute tubercles in the thoracic glands, and one or two also in the lungs, liver, and spleen, such lesions have been produced by many of our Group II. viruses, and it cannot be maintained that this animal affords any certain proof of increase of virulence. This, however, is not the case with the two other calves injected at the same time.

No. 321 received a dose estimated to contain 3,500,000 tubercle bacilli, the same number as was contained in the dose given to No. 225. The calf rapidly developed severe general tuberculosis, and was very ill when killed 63 days after injection.

Calf 325, which received a dose estimated to contain 500,000,000 tubercle bacilli, which was slightly smaller than the number injected into No. 301, developed very acute miliary tuberculosis, and was in a dying state when killed 24 days after the injection. Rabbits injected with the same emulsion also died of general tuberculosis.

We may conclude from these results that at this stage the virus possessed all the virulence for the bovine and rabbit species of the viruses belonging to Group I. The fact that No. 315 did not develop general tuberculosis is not in conflict with this conclusion, because, as already stated, even typical viruses of Group I. cannot be relied upon to produce general tuberculosis with this dose.

To sum up these results, we may say that the virus derived from a case of meningitis and general tuberculosis in a young child, which probably arose in a bronchial gland, possessed, in all probability, when first tested on bovine animals, a low degree of virulence for them characteristic of our Group II. It is not possible to make a more definite statement, because the doses used at this stage of the experiment were too small. It is more certain that after the virus had passed through a series of three guinea-pigs and a calf its virulence for the ox species had become greatly augmented, and that it then possessed the high bovine virulence characteristic of our viruses of Group I., and that at an intermediate stage, when it was injected into Calf 301, its virulence was notably higher than that of viruses of Group II., but had not yet reached the standard of a virus of Group I.

Culture Injections.

Unfortunately, no cultures were obtained either directly or indirectly from the human material, nor from the calves which were injected in the earlier stages of the experiment. The first culture obtained was sown from the posterior thoracic gland of Calf 301. It was eugonic. Its virulence was not tested until after it had been fifteen months in artificial culture on bovine serum. At this period it was injected in 50 mg. doses into two calves, and also into rabbits.

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* It is quite possible that the "F.L." virus, when it was injected into Calf 223, that is when it first came from man, had not the full degree of bovine virulence which it afterwards attained; in other words, that "F.L." affords another instance of modification.

† *See* Calf 223 (H. 20. "F.L."). Calf 797 (H. 49, "T.C."). Heifer 11 (H. 2. "Sp.A."). Bull Calf 35 (H. 10. "B.S.").

‡ For the effect of injecting a virus of Group II. into the peritoneal cavity, *see* Calf 309 (H. 11. "E.D.").

Calf 761 developed a tumour at the seat of inoculation, consisting of a fibrous walled cyst with softened caseous contents. The nearest prescapular gland contained a large caseous nodule, and this also was softened. These lesions are characteristic of viruses of Group II. There were, however, in the lungs some small lesions slightly more severe than those commonly produced by viruses of Group II. These consisted of about a dozen pea-sized fibrous nodules with large irregular caseating nuclei. One of these nodules was ½ in. in diameter, and there were also smaller tubercles, each with a caseous centre. It is in the existence of this central caseation as well as in their size, that these lesions differ from those sometimes produced by viruses of Group II.

A corresponding calf, No. 765, developed minimal lesions which did not extend beyond the nearest lymphatic glands. The rabbits also developed minimal lesions.

Thus if the virulence at this stage differed at all from that of a virus of Group II., the difference was slight only. The virulence must undoubtedly have been higher fifteen months earlier when the virus existed in the body of Calf 301, which suffered from acute general tuberculosis. This conclusion is supported by the fact that an emulsion of the thoracic gland of this animal produced general tuberculosis when injected into a rabbit. We are therefore bound to conclude that this strain was once virulent for rabbits and calves, and that its virulence was unstable, and disappeared during the course of fifteen months' cultivation on artificial media. A parallel instability of virulence has already been described in one strain obtained in each of the two previously described modification experiments.

To return to the virus "A.D." A second culture obtained from Calf 321, injected in a dose of 50 mg. into Calf 825, provoked acute miliary tuberculosis, which proved fatal in 25 days, thus confirming the opinion already expressed, that in the final stage of the passage experiment the virus had attained the high bovine virulence characteristic of our Group I. Injected in 10 milligramme doses into Calves 821 and 823, it produced severe tuberculosis fatal in 50 days in one, and slight tuberculosis only in the other.

This culture was distinctly dysgonic, and showed as much reluctance to grow on glycerin media as any of our viruses of Group I.

CALVES INJECTED WITH THE VIRUS H. 13. "A.D."

I.—Tissue Emulsions.

	Number of Animal.	Mode of Injection.	Estimated dose of Tubercle Bacilli.	Fate of Animal and Condition at Death.	Amount and Range of Tuberculous Lesions at Death.
CALVES INJECTED WITH EMULSION OF HUMAN BRONCHIAL GLANDS.					
—	Calf 119	S.	16.000	Killed when well after 67 days.	Local tuberculosis.
—	Calf 129	S.	16.000	Killed when well after 66 days.	Local tuberculosis.
CALVES INJECTED WITH THE VIRUS DESCENDED FROM CALF 129.					
1st Passage ...	Calf 299	P.	541,333,000	Killed when well after 87 days.	Slight tuberculosis.
	Calf 301	S.	541,333.000	Killed when very ill after 33 days.	General tuberculosis, severe.
2nd Passage...	Calf 315	S.	15,000	Killed when well after 70 days.	Slight tuberculosis.
	Calf 321	S.	3,500,000	Killed when very ill after 63 days.	General tuberculosis. severe.
	Calf 325	S.	500,000,000	Killed when dying after 24 days.	General tuberculosis, severe.
CALF INJECTED WITH THE VIRUS DESCENDED FROM CALF 119.					
1st Passage ...	Calf 225	S.	3,400,000	Killed when well after 89 days.	Local tuberculosis.

S = Subcutaneous. P = Intraperitoneal.

RABBITS INJECTED WITH THE VIRUS H. 13. "A.D."†

I.—Tissue Emulsions.

Source of Material used for Injection.	Number of Rabbit.	Estimated dose of Tubercle Bacilli.	Killed or Died.	Duration of Life in Days.	Result.
Guinea-pigs 905-907. (Third series from Calf 129.)	28	135,330,000	Died	21	General tuberculosis.
	29	..	,,	12 (Subcutaneous).	No tuberculosis.
Calf 301 ... .. (*Thoracic gland.*)	37	99,332,000	..	57	General tuberculosis.
	38	37,000,000	,,	18 (Intravenous).	Lungs solid. Tubercle bacilli swarming in all organs.
Calf 301. (Through Rat 15.)	107		..	16	Tuberculosis of peritoneum. Tubercle bacilli in organs.

† All injections were intraperitoneal, except where otherwise mentioned.

CALVES INJECTED WITH THE VIRUS H. 13. "A.D."

II.—Cultures.

—	Immediate Source of Culture.	Total Duration of Cultivation.	Number of Calf.	Weight in Kilos.	Fate of Animal and Condition at Death.	Amount and Range of Tuberculous Lesions at Death.
			A.—Dose: 50 Milligrammes. *Subcutaneous.*			
1st Passage ...	Calf 301	15 months	761	62·58	Killed when well after 90 days.	General tuberculosis, slight.
„	„	„	765	65·75	Killed when well after 91 days.	Local tuberculosis.
2nd Passage...	Calf 321	15½ months	825	44·44	Died after 25 days.	General tuberculosis, severe.
			B.—Dose: 10 Milligrammes. *Subcutaneous.*			
1st Passage ...	—	—	—	—	—	—
2nd Passage...	Calf 321	15½ months	821	41·27	Dying after 50 days.	General tuberculosis, severe.
„	„	„	823	43·54	Killed when well after 90 days.	Slight tuberculosis.

RABBITS INJECTED WITH THE VIRUS H. 13. "A.D."

II.—Cultures.

—	Immediate Source of Culture.	Total Duration of Cultivation.	Number of Rabbit.	Weight in Grammes.	Killed or Died.	Duration of Life in Days.	Result.
			A.—Dose: 10 Milligrammes. *Intraperitoneal.*				
1st Passage ...	Calf 301	15 months	372	1,070	Killed	90	Slight tuberculosis of lung, peritoneum, and kidneys, ? liver. (Injection ? intracæcal.)
2nd Passage...	Calf 321	15½ months	518	1,240	Died	132	Chronic tuberculosis. (Injection intracæcal.)
			B.—Dose: 1 Milligramme. *Intraperitoneal.*				
1st Passage ...	Calf 301	15 months	373	800	Killed	90	Chronic general tuberculosis.
2nd Passage...	Calf 321	15½ months	519	1,220	Died	33	General tuberculosis.
„	„	„	520	1,200	„	36	General tuberculosis.
„	„	24 months	856	660	„	17	General tuberculosis.
„	„	„	857	630	„	19	General tuberculosis.

The hypothesis that one was dealing with a mixture of bacilli belonging to Groups I. and II. was tested in this case as was done in the case of the first modification experiment. The first virulent culture, namely that from Calf 321, was grown for several generations on glycerin serum, a method which, as already stated, has sometimes been successful in eliminating the virulent (dysgonic) element from an artificial mixture. In this case the strain was grown for six generations during ten months and finally on pure serum. A parallel series of cultures was kept up on pure serum. When the final test was made the strain was two years old. Both series of culture proved to be fully virulent for rabbits.

The result of these experiments lent no support to the hypothesis that we had to deal with a mixture of bacilli of Groups I. and II.

INJECTION OF RABBITS; MADE TO DETERMINE WHETHER THE VIRUS CONTAINED A STRAIN OF BACILLI, BELONGING TO GROUP II., AND CAPABLE OF BEING ISOLATED BY MEANS WHICH PROVED SUCCESSFUL IN SEPARATING AN ARTIFICIAL MIXTURE OF GROUPS I. AND II., NAMELY, GROWTH ON GLYCERIN MEDIA.

CULTURES DERIVED FROM CALF 321, DIRECT [SECOND PASSAGE].

Glycerin-Serum Series.

Cultures 3 weeks old. Rabbits inoculated intraperitoneally.

Generation of Culture.	Length of time during which strain has been in artificial cultivation.	Medium on which final culture was grown.	Dose in Milligrammes.	Number of Rabbit.	Killed or Died.	Duration of Life in Days.	Result.
16th [After 6 on glycerin serum].	2 years in all [10 months on glycerin serum].	Pure serum	10·0	852	Died	15 days	General tuberculosis.
			10·0	853	,,	12 days	Early general tuberculosis.
			1·0	854	,,	21 days	General tuberculosis.
			1·0	855	,,	21 days	General tuberculosis.

Serum Series. [Controls.]

Cultures 3 weeks old. Rabbits inoculated intraperitoneally.

Generation of Culture.	Length of time during which strain has been in artificial cultivation.	Medium on which final culture was grown.	Dose in Milligrammes.	Number of Rabbit.	Killed or Died.	Duration of Life in Days.	Result.
14th on pure serum.	2 years	Pure serum	1·0	856	Died	17 days	General tuberculosis.
			1·0	857	,,	19 days	General tuberculosis.

MODIFICATION OF VIRULENCE OF THE VIRUS H. 49. "T.C."

In the hitherto described instances the modification has been complete, that is to say, the viruses had at the start the low degree of bovine virulence characteristic of Group II., and they ended with the high degree of bovine virulence characteristic of Group I.

In the case now about to be described the original virulence at first fell only a little short of the virulence of Group I., and it gained the full virulence characteristic of this class after a *single* passage through a calf.

The case presents several points of interest. It is the only one[*] in which the original virulence (for ox and rabbit) of a virus obtained from man was in any sense intermediate between our Groups I. and II. As already stated it was much nearer Group I. than Group II. And of all the viruses which were virulent for the ox and rabbit it was the only one which came from an adult. The fact that the least virulent of the virulent viruses came from the oldest patient, in whom, moreover, the disease was of long standing, may be taken as evidence that the bacillus of Group I. becomes modified in the direction of Group II. by residence in man.

If this kind of modification can be established, it supports strongly the evidence of the contrary kind of modification, namely, that of Group II. into Group I. in the ox.

T.C. was a youth who died at the age of eighteen of tuberculosis of the lungs. There were small cavities in those organs, but there was evidently much older disease in the mesenteric glands, one of which was nearly as hard as stone.

Unfortunately no strain of tubercle bacilli was obtained from the lung. All the animals injected with an emulsion made from it died of some acute infection; but a strain of culture was obtained directly from the mesenteric glands. This strain was injected when only two months old in doses of 50 mg. of bacilli into two calves.

One of these, No. 787, died 81 days after injection of severe tuberculosis of the lungs, with a few small tubercles in other organs. The other, No. 797, killed after 83 days, had only small lesions near the seat of inoculation, and a few little tubercles in the lungs and thoracic glands.

Even allowing that this animal was a highly resistant individual it cannot be doubted that this result indicates a degree of virulence which is distinctly below the standard of Group I. The only instance in which 50 milligrammes of a true Group I. virus failed to produce fatal tuberculosis within three months occurred in the case of Calf 667, H. 10. "B.S.," and in this animal the lesions were far more severe and very widespread.

But in order to leave no doubt as to the degree of virulence of the virus at this stage four additional calves were subcutaneously injected with a culture of the same strain, on November 3, 1905, two receiving 50 milligrammes and two 10 milligrammes. The former pair, Nos. 957 and 959, died in 61 and 53 days respectively of general tuberculosis. This is distinctly longer than the usual duration of illness after 50 milligrammes of a virus of Group I., and therefore afford additional evidence of the failure of the virus at this stage to reach the standard of that group. Of the two animals which were injected with 10 milligrammes, No. 953 died of general tuberculosis after 108 days, and No. 945 was killed when in good health after 96 days, and showed, in addition to a local lesion, and tuberculosis of the nearest lymphatic glands, only a few small lesions scattered in the lungs, liver, spleen, and in the thoracic and portal glands. That these results indicate that the virulence for the calf was not quite up to the standard of Group I., can be best seen by referring to the diagram* which sets out the duration of life of calves which received subcutaneous injections of 50 and 10 milligrammes of culture of Group I. viruses. The four calves above mentioned are placed in this table for comparison.

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[*] Except the lupus virus H. 53. "D.H." and possibly H. 20. "F.L."

Stronger evidence that the virulence of the virus was not up to the standard of Group I. was afforded by the injection of rabbits. These animals died of tuberculosis, but after a disease which was protracted decidedly beyond the usual limits. Thus even 50 milligrammes injected intraperitoneally proved fatal only in 39 days, 10 milligrammes in 69 and 35 days respectively, 1 milligramme in 87, 59, and 88 days respectively, and 0·1 milligrammes in 79 and 60 days respectively. The unusual slowness with which the disease in these cases approached a fatal termination can be best appreciated on reference to the table of culture injections into rabbits.†

These injections of calves and rabbits indicate, I think, sufficiently clearly that the virus H. 49. "T.C." when first obtained from man had a degree of virulence for these animals which approximated to, but fell somewhat short of, the standard of viruses of Group I.

Full bovine virulence was, however, obtained by passage through a single calf.

From the prescapular gland of No. 797, the calf which was the least affected of those which were injected with culture from the original material, a culture was made, and this was injected subcutaneously into four calves, two receiving 50 milligrammes and two 10 milligrammes.

All four suffered from very acute and fatal general tuberculosis. Nos. 931 and 949 (50 milligrammes) died in 21 and 39 days respectively, and Nos. 929 and 933, which received 10 milligrammes, died one in 39 days and the other actually earlier than either of the 50 milligramme calves, namely, in 19 days.

That this was a real increase of virulence I think cannot be denied. The rabbits also, injected at the same time as the calves just mentioned, gave similar results. All died very rapidly of general tuberculosis, in a much shorter time than those which received corresponding doses of the culture obtained direct from the human mesenteric glands.

The experiment with this virus therefore falls to some extent into line with the modification experiments previously described. In them the original virulence for calves and rabbits was that of an ordinary member of Group II. In this it was high for these animals, but not up to the standard of Group I. In all, the virulence eventually rose to the full standard of Group I. The patient from which the virus was obtained in this case was a young adult, the only one from whom a virus has been obtained which was originally virulent for calves and rabbits. In the mesenteric glands of this youth there was tuberculous disease of very old standing. He died of more recent tuberculosis of lung. Here then we seem to have got a case of mesenteric infection with a bovine tubercle bacillus, probably in childhood, and when the disease proved fatal the bacilli had already to some slight but definite extent lost their virulence for calves and rabbits; and full virulence was rapidly restored by passage through a calf.

It is much to be regretted that we failed to get a strain of tubercle bacilli from the lungs of this patient.

The virulence for calves and rabbits of the original strain disappeared under artificial culture, as the following experiments will show.

The strain cultivated from the human mesenteric glands had, as already stated, been tested on calves and rabbits and found virulent. These tests had been made when it had been two months under cultivation on pure serum. They were repeated when it had been growing for seven months; the strain was still virulent. It was then grown for three generations on glycerin serum, a control strain being kept up on pure serum. These cultures were tested when the strain had been nine months under artificial cultivation. The result was unexpected. Not only had the cultures of the glycerin series lost their virulence for the rabbit, but those of the control series on pure serum also.

About two months later the strain was again tested. From a culture grown for the first time on glycerin serum two strains were raised, one from a small colony and the other from a large colony; the former was grown again on pure serum, and the latter on glycerin serum [for the second time]. Finally pure serum cultures were sown from each and injected into rabbits. *Neither* culture proved virulent.

In order to leave no doubt about this unexpected loss of virulence the culture was again tested on Calf No. 1097 and three rabbits. The strain had then been thirteen and a half months under artificial cultivation, always on pure serum, and had reached its thirteenth subculture.

These animals were killed three months after injection, and only the minimal lesions, characteristic of an injection with a virus belonging to our Group II., were found.

SUMMARY.

These results may be summarised as follows. A strain of culture was raised from the mesenteric glands of a youth, the subject of mesenteric and pulmonary tuberculosis, the former being evidently of very long standing.

When first tested two months after isolation from man this strain of tubercle bacilli was virulent for calves and rabbits, and produced fatal tuberculosis in them. But the virulence for these animals was definitely below the standard of our Group I.

Passed through a single calf the virus at once reached this standard; and proved as rapidly fatal to calves and rabbits as any we have dealt with.

The same virus, however, lost its virulence for these animals during artificial cultivation; and when tested nine and again thirteen months after isolation, it was found to possess then no more virulence for them than any virus belonging to our Group II.

Of these facts there is ample evidence, a sufficient number of animals having been injected on each occasion to eliminate any uncertainty which might arise in consequence of the known difference of susceptibility of different individual animals.

These results are of great interest, for they reveal a virus unstable in both directions; capable of being increased in virulence for the bovine species when passed through a calf, and of losing whatever virulence it possessed for these species during continued growth on artificial media.

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* Appendix to 2nd Interim Report, Vol. II, page 1029.

† Appendix to 2nd Interim Report, Vol. II, page 1091.

CALVES INJECTED WITH THE VIRUS H. 49. "T.C."

Cultures.

[NO INJECTIONS WERE MADE WITH TISSUE EMULSIONS.]

—	Immediate Source of Culture.	Total Duration of Cultivation.	Number of Calf.	Weight in Kilos.	Fate of Animal and Condition at Death.	Amount and Range of Tuberculous Lesions at Death.
			A.—DOSE: 50 MILLIGRAMMES. *Subcutaneous.*			
—	Human mesenteric glands, direct.	2 months	787	44·90	Died after 81 days.	General tuberculosis, moderate.
—	"	"	797	44·90	Killed when we after 83 days.	Slight tuberculosis.
—	"	7 months	957	44 90	Died after 61 days.	General tuberculosis, severe.
—	"	"	959	42·18	Died after 53 days.	General tuberculosis, severe.
1st Passage	Calf 797	2 months	931	56·24	Died after 21 days.	General tuberculosis, severe.
	"	"	949	52·61	Died after 39 days.	General tuberculosis, severe.
			B.—DOSE: 10 MILLIGRAMMES. *Subcutaneous.*			
—	Human mesenteric glands, direct.	2 months	929	47·60	Dying after 39 days.	General tuberculosis, severe.
	"	"	933	52·16	Died after 19 days.	General tuberculosis, moderate.

RABBITS INJECTED WITH THE VIRUS H. 49. "T.C."

Cultures.

—	Immediate Source of Culture.	Total Duration of Cultivation.	Number of Rabbit.	Weight in Grammes.	Killed or Died.	Duration of Life in Days.	Result.
			A.—DOSE: 50 MILLIGRAMMES. *Intraperitoneal.*				
—	Human mesenteric glands, direct.	2 months	448	1,420	Died	39	Slight tuberculosis of peritoneum, lungs and kidneys.
1st Passage	—	—	—	—	—	—	—
			B.—DOSE: 10 MILLIGRAMMES. *Intraperitoneal.*				
—	Human mesenteric glands, direct.	2 months	449	1,010	Died	69	General tuberculosis.
—	"	7 months	658	1,300	"	35	Tuberculosis of peritoneum. Slight tuberculosis of lungs and kidneys.
1st Passage	Calf 797	2 months	654	1,850	"	15	General tuberculosis, acute.
			C.—DOSE: 1 MILLIGRAMME. *Intraperitoneal.*				
—	Human mesenteric glands, direct.	2 months	450	1,180	Died	87	Severe caseous tuberculosis of peritoneum and lungs. Slight tuberculosis of kidneys.
—	"	7 months	659	1,550	"	59	Tuberculosis of peritoneum, lungs and kidneys.
—	"	"	660	1,610	"	88	General tuberculosis.
1st Passage	Calf 797	2 months	655	1,910	"	21	General tuberculosis.
—	"	"	656	1,470	"	21	General tuberculosis.

RABBITS INJECTED WITH THE VIRUS H. 49. "T.C."—*continued.*

CULTURES—*continued.*

D.—DOSE: 0·1 MILLIGRAMME. *Intraperitoneal.*

——	Immediate Source of Culture.	Total Duration of Cultivation.	Number of Rabbit.	Weight in Grammes.	Killed or Died.	Duration of Life in Days.	Result.
—	Human mesenteric glands, direct.	2 months	451	1,260	Died	79	Slight tuberculosis of peritoneum. Severe tuberculosis of lungs and kidneys.
—	„	7 months	661	1,230	„	60	General tuberculosis.
1st Passage	Calf 797	2 months	657	1,910	„	24	General tuberculosis.

INJECTIONS OF RABBITS SHOWING LOSS OF VIRULENCE AFTER CONTINUED CULTIVATION.

CULTURE DERIVED FROM HUMAN MESENTERIC GLANDS, DIRECT.

Glycerin-Serum Series.

Cultures 3 weeks old. Rabbits inoculated intraperitoneally.

——	Total Duration of Artificial Cultivation.	Medium on which Final Culture was Grown.	Dose in Mg.	Number of Rabbit.	Killed or Died.	Duration of Life.	Result.
9th generation of culture; after 3 on glycerin-serum.	9 months	Pure serum	5	758	Killed	121 days	No tuberculosis. Tubercle bacilli in a dead cysticercus.
			5	759	Died	25 days	Slight tuberculosis of peritoneum and kidneys. Death from other causes.
			1	760	Killed	121 days	Chronic tuberculosis of peritoneum. Trace in lungs and right kidney.

Serum Series.

Cultures 3 weeks old. Rabbits inoculated intraperitoneally.

8th generation of culture on pure serum.	9 months	Pure serum	1·0	757	Died	9 days	Early tuberculosis of peritoneum. Death due to psorospermosis.
			1·0	761	Killed	121 days	Trace of tuberculosis in peritoneum and lungs.
			0·1	762	„	121 days	Trace of tuberculosis in peritoneum and lungs.

SEPARATION OF COLONIES ON A GLYCERIN-SERUM MEDIUM.

Cultures 3 weeks old. Rabbits inoculated intraperitoneally.

Eugonic strain from *large colony* on glycerin-serum culture of 28/11/05. 12th culture; on serum, after 2 generations on glycerin-serum.	11 months	Pure serum	10·0	781	Died	80 days	Minimal tuberculosis, suppuration about head and eyes, and a few small retrogressive tubercles in lungs.
			5·0	782	„	16 days	Tuberculous peritonitis. Death from other causes.
			1·0	783	„	78 days	Slight tuberculosis of peritoneum and lungs. Trace in one kidney.
			1·0	784	Killed	105 days	Slight tuberculous peritonitis. Trace in one kidney.
Dysgonic strain from *small colony* on glycerin-serum culture of 28/11/05. 12th culture; on serum after 1 generation on glycerin-serum.	11 months	Pure serum	10·0	777	Killed	65 days	Chronic tuberculosis of peritoneum and lungs. Trace in one kidney.
			1·0	778	„	105 days	Chronic tuberculosis of peritoneum. Trace in lungs.
			1·0	779	„	105 days	Trace of tuberculosis in peritoneum and lungs.
			0·1	780	„	105 days	Chronic tuberculosis of lungs. Trace in peritoneum and one kidney.

VIRUS H. 49. "T.C."—*continued.*

TABLES SHOWING LOSS OF VIRULENCE FOR CALVES AND RABBITS OF THE STRAIN OF CULTURE DERIVED DIRECT FROM HUMAN MESENTERIC GLANDS, AFTER GROWTH FOR MANY GENERATIONS ON ARTIFICIAL MEDIA. (RE-ARRANGEMENT OF EXPERIMENTS IN PRECEDING TABLES).

Culture Medium Used: Pure Bovine Serum only.

A.—CALVES.

Total Duration of Cultivation.	Number of Calf.	Weight in Kilos.	Dose in Milligrammes.	Fate of Animal and Condition at Death.	Amount and Range of Tuberculous Lesions at Death.
(*a*) Before loss of Virulence.					
2 months ...	**787**	44·90	50·0	Died after 81 days	General tuberculosis, moderate.
	797	44·90	50·0	Killed when well after 83 days.	Slight tuberculosis.
7 months ...	**957**	44·90	50·0	Died after 61 days	General tuberculosis, severe.
	959	42·18	50·0	Died after 53 days	General tuberculosis, severe.
(*b*) After loss of Virulence.					
14 months ...	**1097**	54·42	50·0	Killed when well after 89 days.	Slight tuberculosis.

B.—RABBITS.

Total Duration of Cultivation.	Number of Rabbit.	Weight in Grammes.	Dose in Milligrammes.	Killed or Died.	Duration of Life.	Result.
(*a*) Before loss of Virulence.						
2 months ...	**448**	1,420	50·0	Died	39 days	Slight tuberculosis of peritoneum, lungs and kidneys.
	449	1,010	10·0	,,	69 days	General tuberculosis.
	450	1,180	1·0	,,	87 days	Severe caseous tuberculosis of peritoneum and lungs. Slight tuberculosis of kidneys.
	451	1,260	0·1	,,	79 days	Slight tuberculous peritonitis. Severe tuberculosis of lungs and kidneys.
7 months ...	**658**	1,300	10·0	,,	35 days	Tuberculous peritonitis. Slight tuberculosis of lungs and kidneys.
	659	1,550	1·0	,,	59 days	Tuberculosis of peritoneum, lungs and kidneys.
	660	1,610	1·0	,,	88 days	General tuberculosis.
	661	1,230	0·1	,,	60 days	General tuberculosis.
(*b*) After loss of Virulence.						
9 months ...	**761**	1,100	1·0	Killed	121 days	Trace of tuberculosis in peritoneum and lungs.
	762	1,100	0·1	,,	121 days	Trace of tuberculosis in peritoneum and lungs.
11 months ...	**777**	1,500	10·0	,,	65 days	Chronic tuberculosis of peritoneum and lungs. Trace in one kidney.
	778	1,700	1·0	,,	105 days	Chronic tuberculosis of peritoneum. Trace in lungs.
	779	1,550	1·0	,,	105 days	Trace of tuberculosis in peritoneum and lungs.
	780	1,690	0·1	,,	105 days	Chronic tuberculosis of lungs. Trace in peritoneum and one kidney.
14 months ...	**904**	800	10·0	,,	89 days	Slight tuberculosis of omentum and kidneys.
	905	700	10·0	,,	89 days	Trace of tuberculosis in omentum only.
	906	750	1·0	,,	89 days	Slight tuberculosis of omentum and kidneys.

MODIFICATION OF THE VIRULENCE OF THE VIRUS H. 21. "G.B."

"G.B.", aged sixteen years, died on December 1, 1903, of heart disease and pericarditis. Tuberculous bronchial glands were discovered at the post-mortem examination. They consisted of eight or ten pigmented and congested glands of the size of haricot beans, and most of them showed on section a number of minute grey tubercles. There was no tuberculosis elsewhere.

An emulsion was made of these glands, and injected subcutaneously into calves. It was not very rich in tubercle bacilli, and the 10 cc. of emulsion injected into each was estimated to contain 156,000 tubercle bacilli only. One of these calves, No. 285, was killed after 91 days, and no tuberculous lesions were found, not even at the seat of inoculation or in the glands nearest to it. A week before death the animal was tested with tuberculin, and did not react. The other calf, No. 279, which received the same dose was killed also three months after injection, and there was found at the seat of inoculation a small tumour which had undergone softening, several groups of calcareous grains in the nearest prescapular gland, and three small pinhead translucent tubercles in the spleen. Thus far the lesions caused by this virus in calves were minimal. Rabbits injected at the same time as the calves above mentioned also developed minimal lesions.

The dose given to the calves had been small. It was therefore decided to inject another pair with larger numbers of tubercle bacilli. For this purpose guinea-pigs were injected with an emulsion of the prescapular gland of Calf 279, and from these guinea-pigs other guinea-pigs were injected, and an emulsion was made from their organs and injected subcutaneously into Calves 433 and 447. The emulsion which was rich in tubercle bacilli, was estimated to contain nearly 240,000,000 per cc., and since the volume of the emulsion injected was 20 cc., the number of tubercle bacilli in each dose was very large, namely, nearly 5,000,000,000.

Both calves were killed four months after injection. No. 433 had minimal lesions only, consisting of a small fibro-calcareous lesion at the seat of inoculation, and several little groups of calcareous grains in the nearest prescapular gland.

In No. 447 the lesion at the seat of inoculation was a little more extensive, and there were some calcareous grains in the nearest prepectoral, the thoracic, and one popliteal gland. But in addition to these there were in the lungs one or more small lesions which were of considerable importance, as will appear in the sequel, and therefore they will be described fully.

In the posterior lobe of the left lung was a tubercle about $\frac{1}{8}$ in. or a little more in diameter, reddish in colour, with a grey centre. Two other similar, but rather smaller tubercles were found, one in each lung. In the posterior lobe of the right lung, about 3 in. from the bifurcation of the trachæa, and lying on the inner side of the main bronchus, buried in the lung tissue, was a hard nodule measuring 1 in. by $\frac{3}{4}$ in. by $\frac{1}{2}$ in., which was fibrous and very calcareous on section. It shelled out of the lung quite readily, having a smooth surface, and it was thought that it might have developed in a peribronchial gland, though not quite in the normal situation.

On the anterior and external surface of the root of the right bronchus, close to the bronchus leading to the third lobe, was a slightly enlarged peribronchial gland $\frac{3}{4}$ in. in length. It was firmer than usual, but presented no definite sign of tubercle.

In the posterior thoracic gland, besides the calcareous foci already mentioned, there was a nodule the size of a small gooseberry, full of calcareous grains.

In view of the importance which afterwards came to be attached to these pulmonary lesions, it will be well to show the impression which they made upon one's mind at the time, before any modification of virulence was known to have taken place, and before any question had arisen as to the interpretation of that modification. I will therefore quote *in extenso* a comment written at the time upon the post-mortem examinations of these two calves. It must be understood that this was based entirely on anatomical evidence.

Comment on Calves 447 and 433.

"The dose was one of the largest given, namely, 4,797,600,000 tubercle bacilli. Both calves had a rise of temperature to nearly 41° in the third week. In 433 it soon began to fall, and reached the normal in about five weeks from the day of inoculation. In Calf 447 it remained between 39° and 40° until nearly eight weeks from the day of injection.

"Both animals shortly before they were killed appeared perfectly well and each gave one rather poor tuberculin reaction, but a repetition of the tuberculin injection, and even doubling the dose, gave a complete negative. Thus there is reason to think that in neither animal was the disease progressing at the time it was killed.

"The larger lesion in the lung of Calf 447 was obviously an old one; the three little tubercles appeared more recent. The larger lesion was quite unexpected and unlike anything found in a similar case before. It might be thought possibly due to an independent infection, but the original tuberculin test of this animal was quite satisfactory."

Culture Injections with the "G.B." Virus.

Three strains of tubercle bacilli were raised in culture from Calf 447, namely :—

A. From the thoracic gland, direct.

B. From the prescapular gland through a guinea-pig, No. 1417.

C. From the prescapular gland through a rabbit, No. 155.

This rabbit, when killed six months after injection, was found to have slight tuberculosis, rather widely distributed, not precisely of the average type produced by bacilli of Group II.

Its fellow, No. 156, had developed lesions characteristic of bacilli of Group II.

These three cultures from Calf 447 were eugonic. Their virulence was tested on rabbits and calves with the following results :

The culture from Rabbit 155 was tested, after it had been six weeks under artificial cultivation, on rabbits only. It produced in the usual doses minimal lesions. On the contrary, the cultures obtained direct from the thoracic gland of the calf, and from the prescapular gland through Guinea-pig 1417, though equally eugonic with the one obtained from the rabbit, unlike it, were virulent for calves and rabbits, the virulence being up to the standard (or nearly so) of the virulent viruses.

Thus the anomalous result was obtained that of three strains of tubercle bacilli derived from Calf 447, two were virulent for calves and rabbits, while the other was non-virulent for rabbits—it was not then tested on calves—both a virulent and a non-virulent (for rabbits) strain being obtained from the calf's prescapular gland. All these strains were eugonic, in this respect differing from the virulent strains obtained in the other modification experiments.

Remembering that in each of the other experiments from which modification resulted, there was evidence that the strains of bacilli derived from the first animals to develop tuberculosis were unstable in virulence, it will be asked what was the total duration of cultivation of each of these strains when their virulence was tested ; and whether the differences of virulence is explicable by differences of age. The strains which proved virulent to calves and rabbits were tested after four and seven and a half months artificial cultivation on pure serum respectively, and that which proved non-virulent to rabbits was tested after six weeks' cultivation on the same medium. But in addition the two virulent strains were tested again on rabbits after eleven and eighteen months' growth on serum respectively, and their virulence was found to be unimpaired.

While these strains, unlike the unstable strains from the other modification experiments, retained their virulence for the rabbit when grown for long periods of time on pure serum, they lost this virulence quickly when grown on media containing glycerin.

It will be remembered that repeated cultivation on this medium, which favours eugonic at the expense of dysgonic bacilli, was successful in eliminating the virulent element from an artificial mixture of virulent and non-virulent bacilli, and from a strain derived from a rabbit injected with such a mixture (*see page* 345). The same method was successful with one of the virulent strains now under consideration. The other was sown once on glycerin-serum, sparsely, and from a single eugonic colony of this culture a strain was raised which was not virulent for rabbits. An attempt was made to pick out a dysgonic colony and from it raise a dysgonic and virulent strain, but this was not successful.

The following are the details of these experiments :—

The virulent culture from the prescapular gland of Calf 447 through Guinea-pig 417, after growing for 5 generations on pure serum, was then grown for 4 generations on glycerin media, thus :

6th generation, sown April 17, 1905, on glycerin-agar.

7th generation, sown July 3, 1905, on glycerin-serum.

8th generation, sown July 24, 1905, on glycerin-serum.

9th generation, sown August 28, 1905, on glycerin-serum.

From the 4th culture on a glycerin medium, being the 9th culture in all, serum cultures were sown for the inoculation of rabbits.

As control, a culture sown from the 9th of a series on pure serum was used.

In both cases the actual cultures injected were 21 days old.

INJECTION OF RABBITS; MADE TO DETERMINE WHETHER THE VIRUS CONTAINED A STRAIN OF BACILLI, BELONGING TO GROUP II., AND CAPABLE OF BEING ISOLATED BY MEANS WHICH PROVED SUCCESSFUL IN SEPARATING AN ARTIFICIAL MIXTURE OF GROUPS I. AND II., NAMELY, GROWTH ON GLYCERIN MEDIA.

CULTURE DERIVED FROM THE PRESCAPULAR GLAND OF CALF 447, THROUGH GUINEA-PIG 1417.

Glycerin-Serum Series.

Culture 3 weeks old. Rabbits inoculated intraperitoneally.

Generation of Culture.	Total Duration of Artificial Cultivation.	Medium on which Final Culture was Grown.	Dose in Milli-grammes.	Number of Rabbit.	Killed or Died.	Duration of Life.	Result.
10th. (After 4 on glycerin-serum.)	11 months	Pure serum	10·0	644	Killed	100 days	Slight tuberculosis of peritoneum, lungs, kidneys, and uterus.
			10·0	645	Died	50 days	Slight tuberculosis of peritoneum, lungs, and kidneys. Death due to cysticercosis.
			1·0	646	Killed	100 days	Very slight tuberculosis of lungs ; trace in one kidney. Lesion in cæcum. Injection largely intracæcal.
			1·0	647	,,	100 days	Slight tuberculosis of peritoneum and lungs.

Serum Series. [Controls.]

Culture 3 weeks old. Rabbits inoculated intraperitoneally.

10th on pure serum.	11 months	Pure serum	1·0	648	Died	23 days	General tuberculosis.
			1·0	649	,,	22 days	General tuberculosis.

These experiments show that the virus obtained from Calf 447, indirectly from the prescapular gland through Guinea-pig 1417, which was virulent for calves and rabbits as long as it was grown upon pure serum, entirely lost its virulence for the rabbit (and presumably for the calf also) when grown for several generations on glycerin media, in this respect behaving like the artificial mixture H. 8 "S.C." and H. 10 "B.S."

CULTURE OBTAINED DIRECT FROM THE THORACIC GLAND OF CALF 447.

Successful Attempt to Separate a Strain belonging to Group II., by Cultivation from a Single Colony.

From the 11th culture on pure serum, a glycerin-serum culture was sown on November 28, 1905. On it two large cream coloured colonies appeared, and from one of these a strain was cultivated.

For control the 14th culture on pure serum, sown February 2, 1906, was used.

Separation of Colonies on a Glycerin-Serum Medium.

Culture 3 weeks old. Rabbits inoculated intraperitoneally.

Generation of Culture, &c.	Total Duration of Artificial Cultivation.	Medium on which Final Culture was Grown.	Dose in Milli-grammes.	Number of Rabbit.	Killed or Died.	Duration of Life.	Result.
14th Generation. (*Strain raised from a large colony on glycerin-serum culture of November 28, 1905.*)	18 months	Pure serum	10·0	807	Died	23 days	Tuberculous peritonitis.*
			10·0	808	Killed	159 days	Trace of tuberculosis in omentum.
			1·0	809	,,	159 days	Slight tuberculous peritonitis. Chronic tuberculosis of lungs, and kidneys (rather severe).
			1·0	810	,,	159 days	Slight tuberculosis of peritoneum, lungs and kidneys.

Serum Series [Controls.]

Culture 3 weeks old. Rabbits inoculated intraperitoneally.

14th on pure serum.	18 months	Pure serum	1·0	811	Died	28 days	General tuberculosis.
			1·0	812	,,	32 days	General tuberculosis.

This experiment shows that from the virulent strain derived directly from the thoracic gland of Calf 447, a strain which was not virulent for rabbits was obtained from a single colony.

* Occasionally an injection of a large quantity of bacilli of Group II into the peritoneal cavity of rabbits produces tuberculous peritonitis, which kills rather quickly. The fate of the other rabbits in this experiment clearly shows that the virus possessed the virulence of Group II.

CALVES INJECTED WITH THE VIRUS H. 21. "G.B."

I.—Tissue Emulsions.

—	Number of Animal.	Mode of Inoculation.	Estimated dose of Tubercle Bacilli.	Fate of Animal and Condition at Death.	Amount and Range of Tuberculous Lesions at Death.
CALVES INOCULATED WITH EMULSION OF HUMAN BRONCHIAL GLANDS.					
—	Calf 285	S.	156,000	Killed when well after 91 days	Normal throughout.
—	Calf 279	S.	156,000	,, ,, ,, 91 days	Slight tuberculosis.
CALVES INJECTED WITH THE VIRUS DESCENDED FROM CALF 279.					
1st Passage	Calf 433	S.	4,797,600,000	Killed when well after 111 days	Local tuberculosis.
,,	Calf 447	S.	4,797,600,000	,, ,, ,, 111 days	Slight tuberculosis.

S = Subcutaneous.

RABBITS INJECTED WITH THE VIRUS H. 21. "G.B."

I.—Tissue Emulsions.†

Direct source of Tissue Emulsion used.	Number of Rabbit.	Estimated dose of Tubercle Bacilli.	Killed or Died.	Duration of Life in Days.	Result.
Human bronchial glands ...	20	16,000	Killed	97	Slight tuberculous peritonitis. Translucent tubercles in lungs.
,, ,, ,,	21	16,000	,,	97 (Subcutaneous)	Healthy.
Calf 447 (prescapular gland)	155	—	,,	196	Slight tuberculosis rather widely distributed; not precisely of average type.
,, ,, ,,	156	—	,,	274	Tuberculosis of mammary gland, left kidney and lungs.

† All injections were intraperitoneal except where otherwise mentioned.

CALVES INJECTED WITH THE VIRUS H. 21. "G.B."

II.—Cultures.

DOSE: 50 MILLIGRAMMES. *Subcutaneous inoculations.*

——	Immediate Source of Culture.	Total Duration of Artificial Cultivation.	Number of Calf.	Weight in Kilos.	Fate of Animal and Condition at Death.	Amount and Range of Tuberculous Lesions at Death.
1st Passage	Thoracic gland of Calf 447, direct [Strain A].	7½ months	747	50·80	Dying after 24 days	General tuberculosis, severe.
	Prescapular gland of Calf 447 through Guinea-pig 1417 [Strain B].	4 months	665	43·99	Killed when well ,, 90 days	General tuberculosis, slight.
			669	43·54	Died ,, 55 days	General tuberculosis, severe.

RABBITS INJECTED WITH THE VIRUS H. 21. "G.B."

II.—Cultures.

Intraperitoneal inoculations.

——	Immediate Source of Culture.	Total Duration of Artificial Cultivation.	Dose in Milligrammes.	Number of Rabbit.	Weight in Grammes.	Killed or Died.	Duration of Life in Days.	Result.
1st Passage	Thoracic gland of Calf 447, direct. [Strain A.]	7½ months	10·0	395	1,300	Died	14	General tuberculosis.
			1·0	396	1,300	,,	18	General tuberculosis.
			0·1	397	970	,,	38	General tuberculosis.
			0·01	398	1,020	,,	30	General tuberculosis.
,, ,,	Prescapular gland of Calf 447, through Guinea-pig 1417. [Strain B.]	4 months	25·0	310	970	,,	14	General tuberculosis, acute.
			2·5	311	1,170	,,	19	General tuberculosis, acute.
		11 months	1·0	648	1,850	,,	23	General tuberculosis.
			1·0	649	1,650	,,	22	General tuberculosis.
,, ,,	Prescapular gland of Calf 447, through Rabbit 155. [Strain C.]	1½ months	10·0	434	1,340	Killed	41	Slight tuberculosis of peritoneum and kidneys. Lungs congested, but no tubercle bacilli found in them.
			1·0	435	950	,,	87	Slight chronic tuberculosis of lungs. Trace in peritoneum and kidneys.
			0·1	436	1,190	,,	87	Slight chronic tuberculosis of lungs and kidneys. Trace in peritoneum.

SUMMARY OF THE MODIFICATION EXPERIMENTS.

It may be useful at this point to pass in review some of the principal features of these five modification experiments, and point out where they agree and where they differ.

In three of these experiments the virus was originally a typical member of our Group II. ; it was eugonic, and possessed a very low degree of virulence for the calf and rabbit. In one the original strain was probably of this kind, but the proof is not complete. In the remaining case it was virulent for the calf and rabbit, but distinctly less so than a typical member of our Group I.

After passing through several calves, and in some cases guinea-pigs, the virus in each case came to possess the high degree of virulence for the calf and rabbit characteristic of the viruses belonging to our Group I. Except in the case of H. 21. "G.B.", the cultural characters of the virus in each case changed with the virulence and became ultimately very dysgonic.

In each of the five cases, H. 21. "G.B." again excepted, the strain derived directly or indirectly from the first calf which developed general tuberculosis was after a longer or shorter period of cultivation on pure serum found to have lost its virulence for the calf and rabbit. In some ("J.H." and "A.D.") the strain was not tested until it had already lived some months in artificial culture, and was then found to have this low degree of virulence for these species ; in others ("T.C." and "Sp.B.") it was virulent when first tested and lost its virulence later.

In the case of the virus "G.B." three strains of bacilli were raised from the calf which was the first to develop more than the minimal lesions characteristic of an injection with a virus of our Group II. Of these two were virulent for the rabbit, and one non-virulent. These virulent strains retained their virulence for many months as long as they were grown on pure serum, but lost it as soon as they were grown several times on glycerin media, or when the strain was propagated from a single eugonic colony ; thus behaving like an artificial mixture.

It ought to be mentioned at this point that the stability of virulence of many other strains of Group I. under artificial cultivation, both on media with and without glycerin, has been tested in a large number of cases and after long-continued cultivation, amounting in one case to over two years, and no appreciable modification has been detected in any of them.

On the other hand, when dealing with artificial mixtures of bacilli belonging to our Groups I. and II., or with strains derived from rabbits injected with these mixtures, it has been found possible to separate from these virulent and eugonic mixed strains the element which is eugonic and non-virulent for calves and rabbits. This has been done by raising strains from single colonies which appeared on sparsely-sown glycerin-serum tubes, and also by the method of successive cultivations on glycerin media, which markedly favours the non-virulent eugonic strains at the expense of the virulent dysgonic strains. (*See Report*, Experiments with Mixed Viruses, page 345 of this Volume.)

These experiments gave us a method of testing strains of culture to see whether they contained different kinds of tubercle bacilli. The method has been applied to one or more of the strains raised in the course of each of our modification experiments. The results of these experiments was to afford no evidence of mixture except in the case of "G.B." ; this strain, unlike all the others, behaving exactly like an artificial mixture of bacilli belonging to Groups I. and II. had done.

To recapitulate the principal points of difference between the results obtained from the virus "G.B.", and those with the other viruses which became modified. In each of our modification experiments a strain of bacilli of unstable virulence for the calf and rabbit was obtained.

In the case of four of the modification experiments the strain of culture referred to above proved unstable when grown *exclusively on pure serum*. In the case of "G.B." the strain in question proved unstable only when grown on *glycerin media*, and retained its virulence on pure serum. Moreover, a non-virulent strain was raised on pure serum from a single colony picked out from a culture sown on glycerin-serum for the first time.

Thus the case of "G.B." differs in several important particulars from the other four.

The main question which arises out of these experiments is whether we are dealing with a mixture of two distinct kinds of tubercle bacilli, and the subsequent elimination of one of them ; or whether there occurred a true modification of one kind into the other.

The fact that the strain of tubercle bacilli obtained from Calf 447. "G.B." behaved when grown on glycerin media like mixtures of dysgonic virulent and eugonic virulent bacilli, very strongly supports the suspicion, first raised on purely anatomical grounds, that this calf suffered from a spontaneous infection.

And the facts that strains derived from comparable calves in the other modification experiments behaved differently supports the view that in them a true modification took place. The evidence, however, is not conclusive, and the question whether true modification of the common human type of tubercle bacillus (Group II.) into the common bovine type (Group I.) took place must remain at present undecided.

REPORT ON THE STABILITY OF VIRULENCE OF TUBERCLE BACILLI IN THE LIVING ANIMAL.

PART II.

FURTHER "PASSAGE EXPERIMENTS."

In the previous chapter certain "modification" experiments have been described, which having started with a virus which was eugonic and possessed a very low degree of virulence for the calf and rabbit, in other words a typical member of our second group, ended with a virus possessing a high degree of virulence for these animals, and which grew badly on glycerin media, in other words with a typical member of our Group I. In the present chapter similar experiments which ended otherwise are described.

This second series of modification experiments, that with the virus H. 8. "S.C." alone excepted, were done after the others, and under improved conditions. They differ from the preceding in the following particulars :—

(1) Several of them commenced with cultures, instead of with fresh tissue emulsions, and

(2) Except in the case of the experiments with the virus H. 8. "S.C." the calves were kept in stalls far removed from other animals infected with viruses of Group I.

In the earliest experiments it had not been possible to effect this separation, because at the time they were commenced, the virulence of the viruses employed had not then been determined.

These experiments may be considered under three headings.

(1) Repetitions of the successful "passage" experiments, with the same viruses.

(2) Intravenous "passage" experiments—similar to that with H. 17. "Sp. B." but with other viruses.

(3) Rabbit "passage" experiments.

Charts are given showing the main facts of each experiment.

[1.] Repetition of the Successful "Passage" Experiment with the same Viruses.

(a) H. 16. "J.H." (*See page* 334.)

The intention was to repeat the original experiment as closely as possible, and therefore the method of injection was subcutaneous throughout. It was, however, no longer possible to begin with a tissue emulsion, and a culture had to be used instead. That from G.P. 609 which had been injected with an emulsion of the human joint tissue was chosen, and 50 mg. of bacilli from a three weeks' old growth was alf 527. injected subcutaneously into Calf 527. The virus had then been fourteen months under artificial cultivation.

After ninety days the calf was killed. There was a small caseous abscess at the seat of inoculation, and a few calcareous foci in the prescapular gland.

alf 631. With this unpromising material Calf 631 was injected, as large a dose as possible being used of an emulsion made from the prescapular gland, reinforced by part of the local lesion, and containing 5,000 million T.B. The animal was killed in 113 days, a small ulcer at the seat of inoculation, and some caseo-calcareous patches in the prescapular gland being the only lesions found.

alf 753. A third calf, 753, was then injected with an emulsion of the prescapular gland of the last animal, containing fourteen million T.B. After ninety days the calf was killed, and a few calcareous grains only were found at the seat of injection, and one yellow focus in the prescapular gland. It was obviously useless to continue the experiment.

This experiment would have appeared more satisfactory if the animals had been killed earlier ; but it will be remembered that in the original H. 16. "J.H." passage experiment the first three animals were allowed to live sixty-seven, eighty-one, and eighty-nine days respectively.

The principal difference in the conditions of the two experiments seems to me to have been that the first started with a tissue emulsion, the virus never having been grown in culture, while the second began with a culture of a virus which had been growing for fourteen months on artificial media.

The question whether this may account for the difference in the result must be considered. On the hypothesis of the original virus being a mixture containing a very small trace of the bacilli of the virulent type, it is of course possible that after long continued cultivation the virulent element had died out. Thus in the first experiment the few virulent bacilli may be considered to have increased relatively to the less virulent by growing in the calf under conditions more suitable to the former, while in the latter experiment this could not take place, because the virulent element had already died out in culture. I do not wish to press this explanation unduly, but put it forward as one of the possibilities to be considered.

(b) *Repetition of the* H. 17. "Sp.B." *Intravenous "Passage" Experiment.* (*See page* 335.)

Here again one had to begin with a culture, that from Guinea-pig 1235 (the emulsion of whose organs formed the starting point of the first intravenous series) being used. It had at that time been growing for about eight months on artificial culture media. A growth three weeks old was used, and 10 milligrammes of bacilli were injected intravenously into Calf 685. Calf 685. At the same time two calves received 50 milligrammes each subcutaneously. These were to serve as controls.

The intravenous calf was killed sixty-four days later, a moderate number of little tubercles being found in the lung. None were present in the thoracic glands, which appeared to be normal. The two calves injected subcutaneously developed minimal lesions. An emulsion of the little tubercles in the lungs of Calf 685 was made, but as only three or four bacilli could be found in the microscopic preparation, it was thought useless to continue the experiment.

Accordingly it was repeated with a larger dose, the same strain now about eleven months in artificial cultivation being used, and 90 milligrammes of bacilli injected intravenously into a young bull, 607 (nine Bull 607. months old). This did not produce so severe a result as was expected ; probably the age of the animal (it weighed about three times as much as the calves usually employed) accounted for its greater capacity for resistance. The animal was killed after 48 days. There was a small caseous mass just outside the wall of the vein at the seat of inoculation, indicating that the material injected had not all gone into the circulation. The lungs appeared slightly indurated, but no tubercles were found in them. A few small tubercles were seen in each kidney ; all other organs appeared perfectly normal. No tubercle bacilli could be found in preparations from the lungs, thoracic glands, liver, or spleen, and only two in a film made from the kidney tubercles.

The paucity of infective material made it useless to continue this experiment.

It is not a satisfactory negative result ; the dose in the first case being too small, and in the second having failed in part to reach the circulation.

[2.] Intravenous "Passage" Experiments Similar to those with the Virus H. 17. "Sp.B.", but with other Viruses.

A preliminary experiment was made with the virus H. 8. "S.C."; for the others the lung viruses H. 22. "F.W.", H. 25. "A.T.", and H. 23. "J.P." were selected.

(a) *Virus* H. 8. "S.C." *Intravenous Passage Experiment.* (*See page* 336.)

The intravenous series was commenced with a tissue emulsion of Guinea-pigs 912–915. These were the third of a succession, the first of which had been injected from the original Calf 177. This calf had received a very large dose of a broth culture, which had descended direct from the human mesenteric glands. Thus the virus had passed through a culture, one calf, and three guinea-pigs before it reached the first intravenous calf, No. 305.

Calf 305. Calf 305 received intravenously 9 cc. of tissue emulsion containing 729,000,000 tubercle bacilli. At the same time, Calf 303, which serves as a useful control, received 10 cc. subcutaneously. The latter developed minimal lesions which did not extend beyond the prescapular gland.

The intravenous calf, 305, was killed when very ill, twenty-six days after the injection. The lungs were hepatized anteriorly, and partially so elsewhere. No obvious tubercles were seen, but some minute doubtful grey points were noticed in some of the darker portions. Innumerable little grey dots, apparently tubercles, were seen in the liver. Tubercle bacilli were found in the lungs, liver, spleen, and many lymphatic glands.

An emulsion of the posterior mediastinal gland of Calf 305 was used for the subcutaneous injection of Calves 275 and 325. These developed minimal lesions.

Calf 361. A second calf, 361, was then injected intravenously with 20 cc. of an emulsion of the local lesion of Calf 275, containing 41,000,000 tubercle bacilli. It remained fairly well, and was killed when in good condition seventy-six days after the injection, having gained in weight 43 lbs. One was rather surprised therefore to find innumerable little miliary tubercles in the lungs and liver, while a smaller number appeared in spleen, kidneys, &c. Tubercle bacilli were present everywhere, but were not very numerous. The tubercles in the lungs were grey and translucent peripherally, and more opaque in their centres. In the spleen they were rather larger, yellowish in colour, with thin translucent grey margins.

These two instances of general miliary tuberculosis being caused by the intravenous injection of a virus which was not virulent when injected subcutaneously, were among the first observed, and made a great impression. At the time I was inclined to regard the disease in these animals as progressive, but further experience has shown that in very similar cases this is not the case.

From the second intravenous Calf 361 two calves, 419 and 423, were injected subcutaneously with 20 cc. of an emulsion of the thoracic glands, containing over 6,000,000 bacilli. These calves developed minimal lesions only, and a goat which received half this quantity remained well.

Thus there was no evidence of any increase of virulence.

The residence of the tubercle bacilli in the two intravenous calves, taken together, amounted to 102 days, but between these two they were existing in a retrogressing local lesion of another calf for fifty-nine days. The total duration of residence in the bovine species was 10 months.

(b) *Virus* H. 22. "F.W." *First Intravenous "Passage" Experiment.* (*See page* 337).

Calf 399. The intravenous series was commenced with a tissue emulsion, the lesions of Guinea-pig 1200 being used. This animal had been infected from another guinea-pig which had itself been infected from Calf 291, injected subcutaneously with an emulsion of human lung. Of the guinea-pig tissue emulsion Calf 399 received intravenously a dose containing nearly 720,000,000 tubercle bacilli. The animal was killed when very ill thirty-four days later. There was tuberculous lobular pneumonia, but no definite tubercles visible to the naked eye. Tubercle bacilli were numerous almost everywhere.

Calf 457. An emulsion of the thoracic gland was made and injected into Calf 457 intravenously, the dose containing 20,000,000 tubercle bacilli. The animal died in fifty-seven days. There was miliary tuberculosis of lungs, and caseation of the bronchial and other thoracic glands. Other parts also were affected.

Calf 505. An emulsion was made of the bronchial glands, and a dose containing over 11,000,000 tubercle bacilli intravenously injected into Calf 505. The animal was killed after sixty-two days. Three minute tubercles only were seen in its lungs, and a considerable number of yellow calcareous grains in the thoracic glands.

There was evidently little chance of success in continuing the series, and it was thought preferable to begin again, using larger doses.

(c) *Virus* H. 22. "F.W." *Second Intravenous "Passage" Experiment.* (*See page* 338).

Calf 749. This time it was necessary to begin with a culture, that from the original Calf 293 being selected. It had at that time been fourteen months in cultivation. A dose of forty-six milligrammes of bacilli from a serum culture, twenty-one days old, was intravenously injected into Calf 749. It was killed when very ill, twenty-four days later. The lungs were extensively consolidated, but without visible tubercles; the thoracic glands were caseous.

Calf 811. An emulsion was made of the thoracic glands, and a dose containing 250,000,000 tubercle bacilli injected into Calf 811. It was killed forty-nine days later. A perivascular lesion at the seat of injection showed that the infective material had failed, at least to a great extent, to reach the circulation. There were no tubercles visible in the lung, and only a few caseous foci in the thoracic glands.

An emulsion was accordingly made from the perivascular lesion, and injected intravenously into Calf 817. The dose contained nearly 891,000,000 tubercle bacilli.

Calf 817. The animal was killed thirty-one days later. There were some small tubercles in the heart and vena cava superior. The lungs were everywhere finely mottled with minute irregular greyish spots and pinkish grey areas. The former lacked the sharpness of outline, roundness and translucency of the usual non-progressive tubercle. In the latter, which were airless, an irregular branch-like more opaque and whitish mottling could be seen on section (probably the ramifications of the terminal bronchi).

An emulsion of lung and another from the bronchial gland, were made for injection, but tubercle bacilli proving very rare in either, they were not used, and the experiment closed.

(d) *Virus* H. 25. "A.T." *First Intravenous "Passage" Experiment.* (*See page* 340.)

The first attempt was made with an emulsion of the prescapular gland of Calf 449. This animal had been injected with an emulsion of the tuberculous organs of a guinea-pig infected with the human lung, a dose of 10 cc., containing 11,000,000 tubercle bacilli, being intravenously injected into Calf 467.

Calf 467. The calf was killed after sixty-two days. Only ten or a dozen very small tubercles, as clear as glass, and each with a minute opaque centre, were found in the lungs. The bronchial and other thoracic glands contained a few calcareous grains. Four small tubercles with yellow centres were found in the liver, and one in the spleen. The hepatic gland contained a few calcareous grains.

The disease was clearly not progressive, and it was thought better to begin again with a larger dose rather than to go on.

(e) *Virus* H. 25. "A.T." *Second Intravenous "Passage" Experiment.* (*See page* 339).

In this experiment a culture derived from Calf 417, the animal injected with the original lung tissue, was used. At that time it had been nearly eleven months in artificial cultivation.

100 mg. of bacilli were injected intravenously into a

ull 551. young bull, No. 551, about ten months old, and weighing 3 cwt. 3 qrs. 18 lbs., about three times as much as the calves generally used.

The bull died twenty-one days later. The lungs were heavy and extremely congested ; innumerable minute tubercles were distinctly visible in some of the darker lobules, and elsewhere one could make them out with more or less certainty. The liver was faintly mottled, as though with innumerable barely visible tubercles. The thoracic glands were greatly enlarged, and their cortex opaque and white.

An emulsion was made from the posterior thoracic gland, and 12 cc., containing nearly 1,000 million tubercle bacilli, were intravenously injected into Calf 831. alf 831.

This animal died seventeen days later with extreme congestion of a considerable part of the small intestine, which was thought to be due to infarction. The lungs were congested and mottled, but no tubercles could be seen in them. The thoracic glands, slightly swollen, were a little firmer than normal. Tubercle bacilli were found in all the great organs and in all the glands examined.

An emulsion was made of the right bronchial gland, and 23 cc., containing 2,000 million tubercle bacilli alf 859. were intravenously injected into Calf 859. The animal died nineteen days later. Little tubercles were numerous in the right side of the heart. The lungs were purple and intensely congested, and they were almost entirely consolidated. They showed an indistinct grey mottling, but no definite tubercles could be seen. The bronchial and other thoracic glands were much enlarged and firmer than normal.

An emulsion was made of the thoracic glands, and 11½ cc., containing 346 million tubercle bacilli, were alf 861. intravenously injected into Calf 861.

This animal was killed when very ill thirty days after injection. Minute tubercles were found on the endocardium of the right side of the heart. The lungs were voluminous and heavy ; portions of the anterior lobes, and scattered deeply-seated lobules elsewhere, were consolidated. Other parts were mottled with innumerable little reddish points, but no tubercles were distinctly visible. The thoracic glands were enlarged. Tubercle bacilli in the lungs and in the thoracic glands were very scanty, so few indeed that it seemed useless to inject another calf.

Two rabbits, Nos. 539 and 540, were injected intraperitoneally with the emulsion used for the last calf. When killed more than a year later, one was found to be fat and well and had only a few translucent tubercles in the meso-colon and omentum ; the other was thin, and in addition to the usual minimal lesions had destructive caseous tuberculosis of one knee and of the opposite ankle joint. Other instances of tuberculosis of joints have occurred in rabbits injected with viruses of Group II., and the caseous matter from one of these joints has been injected into another rabbit without producing anything more than the usual minimal lesions characteristic of injections with bacilli of Group II. (*See* Rabbits 263 and 639 in the H. 12. "H.N." Rabbit "Passage" experiment which follows.) Rabbit 539 then does not afford any evidence of increase of virulence. In brief, four calves were intravenously injected in succession with doses so large as to cause fatal results, and yet no increase of virulence was obtained.

This experiment seems to be a very clear and complete negative one, and it is difficult to see what more could be done, short of extending it further, to favour the growth of the bacilli in the body of the bovine animal. The total duration of the experiment from the first intravenous injection to the death of the last calf was only eighty-seven days, and yet four calves were used. It seems one must either use a very large dose capable of killing in three weeks or less, or one will not produce any serious infection, and thus will be unable to recover sufficient tubercle bacilli to continue the series.

(f) *Virus* H. 23. "J.P." *First Intravenous "Passage" Experiment.* (*See page* 340.)

Calf 441 received an intravenous injection of an Calf 441. emulsion of the prescapular gland of Calf 345, one of the calves injected with the original lung emulsion. The amount injected was 20 cc., and it was estimated to contain over 13,000,000 tubercle bacilli. The animal was killed 102 days later. Some of the lobules in the lungs were consolidated and calcified, and there were a number of little grey pin point tubercles. Little calcareous points were found in the thoracic glands, and numerous little tubercles were just visible in the liver. There were also little tubercles elsewhere. A perivascular tumour at the seat of inoculation showed that the injection had not been entirely intravenous. Tubercle bacilli were sought in all affected parts and elsewhere, but were found only in the lung and the popliteal gland, and then in very small numbers. It was therefore decided to abandon the attempt with this virus.

[3.] Rabbit "Passage" Experiments.

Attempts to increase the virulence of tubercle bacilli by continued growth in rabbits have been made with twelve viruses.

The largest possible doses were injected throughout. The first injections were usually made into two animals, into one intravenously and the other intraperitoneally. Subsequent injections were made intraperitoneally with emulsions of tuberculous tissue. No series of intravenous injections have been made, because they are so rapidly fatal.

The following is a list of the viruses used, the number of "passages," and the total duration of each experiment :—

Virus.	Probable primary seat of disease.	Number of passages through Rabbits.	Total duration of experiment.
H. 12. "H.N." ...	Mesenteric glands	(*a*) 5 (*b*) 4 (*c*) 2	21 months. 24 months. 10 months.
H. 8. "S.C." ...	,, ,,	2	6 months.
H. 18. "T.T." ...	,, ,,	2	13 months.
H. 30. "E.M." ...	,, ,,	2	8½ months.
H. 33. "R.T." ...	Cervical glands	(*a*) 3 (*b*) 3	21 months. 21 months.
H. 22. "F.W." ...	Lung	(*a*) 3 (*b*) 2	12½ months. 6 months.
H. 45. "F.M." ...	,,	(*a*) 3 (*b*) 3 (*c*) 2	13½ months. 13½ months. 10 months.
H. 25. "A.T." ...	,,	2	12½ months.
H. 11. "E.D." ...	Elbow joint	3	12 months.
H. 9. "C.T." ...	Wrist joint	2	5 months.
H. 47. "S.B." ...	Hip joint	2	14 months.
H. 16. "J.H." ...	Knee joint	(*a*) 1 (*b*) 1	7 months. 5½ months.

The details of these experiments will be found in the tables. It will suffice to say here that no increase of virulence was observed, although in one experiment a virus H. 12 "H.N." was passed through five rabbits in succession, the whole of this "passage" occupying a period of twenty-one months. This virus had on two occasions produced in calves a number of widely distributed non-progressive tubercles, considerably in excess of those commonly caused by a virus of Group II. One of the rabbits, No. 271, the third of the series, was found when killed in addition to the ordinary lesions to have caseous tuberculosis of the right knee-joint. Another rabbit, No. 640, injected with an emulsion of a caseous mass in the peritoneal cavity of this animal, died after 145 days from chronic progressive tuberculosis. (For post-mortem *see* below.) But another rabbit, 813, injected with an emulsion of the lung of this one, developed the usual minimal lesions, and thus proved that no real increase of virulence had taken place. The experiment was carried out in duplicate, the second series running through four rabbits, and occupying a period of two years. In the third rabbit, No. 263, there was found, when killed, to be caseous tuberculosis of the right knee-joint. The caseous matter from this joint, however, injected into Rabbit 639, produced only the usual minimal lesions.

Another rabbit, No. 260, developed chronic progressive tuberculosis. This was the third of a series injected with the virus H. 22. "F.W." obtained from a case of human phthisis. The total duration of the experiment was just over a year. Unfortunately this animal died at a time when it was not possible to pass the virus on, but it seems reasonable to believe that had this been done the experience obtained with Rabbit 640 would have been repeated. This animal therefore is not regarded as affording any evidence of increase of virulence.

One other rabbit may be referred to here, namely No. 414, injected with culture derived from the virus H. 47. "S.B.," originally obtained from a human tuberculous hip-joint. Killed after 89 days, this animal had rather severe chronic tuberculosis of the lungs, and its uterus, as is not uncommonly the case, was distended with tuberculous pus. This pus, injected into another rabbit, 553, produced only minima lesions. The post-mortem examinations of those rabbits which were more affected than usual are given below in full, but it is not thought necessary to give any more details than those which appear in the table concerning the rabbits which developed only the usual minimal lesions.

In the table of these rabbit "passage" experiments is included a single passage experiment through the rat. The rat, No. 28, had been injected with the virus H. 16. "J.H." obtained from a human knee-joint. It died of tuberculosis 172 days after injection. Rabbits were injected both with culture and with tissue emulsions derived from the lesions of this rat. The results in all cases were the usual minimal lesions characteristic of a virus of Group II.

Summary.

The experiments here reported represent a somewhat extended attempt to increase the virulence of feebly virulent tubercle bacilli by "passage" through refractory animals. Many other attempts have been made earlier by passage through the susceptible guinea-pig, and passage through the rat has not been neglected. It will be remembered also that with many of our earlier feebly virulent viruses passage from calf to calf, or from calf to guinea-pig, and thence again to calf, were freely used, with negative results.

All this amounts to a strong body of evidence, which demonstrates the stability of virulence of the tubercle bacillus in the living animal; and on the other hand, high virulence has been found to be scarcely perceptibly diminished by long-continued growth on artificial media.

The virulence of tubercle bacilli being in general so remarkably stable, one must look for some special or exceptional circumstance to explain the limited number of instances in which virulence has changed.

Whatever be the explanation of these positive passage experiments, the fact remains that they are exceptional, and that in general the virulence of tubercle bacilli, be it high or low, is not readily altered.

POST-MORTEM EXAMINATIONS OF THE MORE SEVERELY AFFECTED RABBITS.

POST-MORTEM ON RABBIT 260. VIRUS H. 22. "F.W."

Died 205 days after an intraperitoneal injection.

In the *Peritoneal Cavity* were three large lobulated tumours, on section resembling brain, and having the consistence of soft putty.

Omentum was normal. There were no tubercles in the peritoneal cavity.

Liver and Spleen were normal.

Kidneys contained large prominent caseo-fibrous tubercles.

Lungs contained, besides caseous tubercles, numerous large cavities, some half an inch in diameter, with smooth caseous walls and containing little else besides air.

Microscopical Examination.

Lung.—Numerous tubercle bacilli, no other micro-organisms seen.

POST-MORTEM ON RABBIT 263. VIRUS H. 12. "H.N."

Killed 240 days after an intraperitoneal injection.

The Peritoneal Cavity contained only a few small circular fibro-caseous tubercles in the gastro-splenic omentum, the falciform ligament, and on the surface of liver.

The Liver substance, *Spleen and Kidneys* were normal.

The Right Lung contained large irregular fibro-caseous nodules; the *Left Lung* was normal.

The Right Knee Joint was tuberculous. It contained excess of fluid with caseous flakes. Considerable collections of soft caseous matter were packed away in corners, and the synovial membrane was swollen, gelatinous and caseous.

Microscopical Examination.

Emulsion of caseous material from knee.—Tubercle bacilli fairly numerous.

POST-MORTEM ON RABBIT 271. VIRUS H. 12. "H.N."

Killed 233 days after an intraperitoneal injection. The rabbit was well grown and fat. *In the abdominal cavity* were eight or ten large spherical collections of soft caseous matter resembling soft putty, enclosed in a thin membrane and attached to the cæcum, spleen, or some other part. They were as large as cherries, and some even larger; besides these were many smaller ones.

The Lungs, Kidneys and other organs were normal.

The Right Knee-joint contained caseous deposit in the mucous membrane.

The Right Popliteal Gland was enlarged and soft, but not caseous.

Microscopical Examination.

Emulsion of caseous matter from abdominal cavity.—No tubercle bacilli seen.

Scraping from Right Popliteal Gland.—No tubercle bacilli seen.

TABLE OF "PASSAGE" EXPERIMENTS ON RABBITS.

Viruses used for the Rabbit Experiments. [The probable primary seat of disease in man is indicated in brackets.]	Primary Inoculation.								First "Passage"—*All Intraperitoneal.*							Second "Passage"—*All Intraperitoneal.*							Third "Passage"—*All Intraperitoneal.*						
	Strain of Tubercle Bacilli with which the Experiment commenced.	Number of Rabbit.	Dose.	Date.	Duration of Life in Days.		Killed or Died.	Result.	Description and Source of Tissue Emulsion used for Injection.	Number of Rabbit.	Dose.	Date.	Duration of Life in Days.	Killed or Died.	Result.	Description and Source of Tissue Emulsion used for Injection.	Number of Rabbit.	Dose.	Date.	Duration of Life in Days.	Killed or Died.	Result	Description and Source of Tissue Emulsion used for Injection.	Number of Rabbit.	Dose.	Date.	Duration of Life in Days.	Killed or Died.	Result.
					Intrap.	Intrav.																							
H. 12. "H.N." *[Mesenteric glands.]*	Culture from Calf 319, direct.	137	About three tube cultures.	Aug. 30, 1904.	—	14	D.	Consolidation of lungs; no tubercles visible.	Emulsion of lung of Rabbit 137.	138	20 cc. very rich in T.B.	Sept. 13, 1904.	170	K.	Abdominal cysts; few tubercles in kidney, one in lung.	Encysted material from abdomen of Rabbit 138.	271	14 cc. [T.B. not very numerous.]	Mar. 2, 1905.	233	K.	Large caseous spherical masses in abdominal cavity. All organs normal. Caseous tuberculosis of right knee joint.	Caseous mass from peritoneal cavity of Rabbit 271.	640	30 cc. [No T.B. seen in emulsion.]	Oct. 21, 1905.	145	D.	Chronic progressive tuberculosis.
										139	„	„	163	D.	Slight tuberculosis of lungs and peritoneum.	Caseous patches from lung of Rabbit 139.	263	15 cc. [T.B. in moderate numbers.]	Feb. 23, 1905.	240	K.	Few fibrous tubercles in peritoneum. Caseo-fibrous nodules in right lung. Caseous tuberculosis of right knee joint.	Caseous matter from knee-joint of Rabbit 263.	639	23 cc. fairly rich in T.B.	Oct. 21, 1905.	297	K.	Chronic tuberculous peritonitis. Trace in lungs and kidneys.
	Do. do.	136	Two tube cultures.	Aug. 30, 1904.	121	—	K.	Mass of putty-like material] encysted in meso-colon. Few small T's. in omentum. Tuberculous pyelitis of both kidneys.	Emulsion of caseo-purulent matter from pelvis of Rabbit 136	229	8 cc. [T.B. not very numerous.]	Dec. 29, 1904.	187	K.	Trace of tuberculosis in peritoneum and lungs.														
H. 8. "S.C." *[Mesenteric glands.]*	Emulsion of lesions of G.-P.'s 1230-1231, from Calf 275.	101	5 cc. [Tubercle bacilli numerous.]	June 28, 1904.	59	—	K.	Slight tuberculous peritonitis. Some minute grey tubercles in lungs.	E. of lesions from Rabbit 101.	129	12 cc. [T.B. not numerous.]	Aug. 26, 1904.	118	K.	Small caseous local lesion. Few foci in omentum. One fibrous focus in lung.														
H. 18. "T.T." *[Mesenteric glands.]*	Culture from G.-P. 1174 (descended from Calf 131).	154	8 cc. of top fluid of emulsion of culture.	Sept. 26, 1904.	—	157	K.	Tuberculous pyelitis of both kidneys. A few caseous tubercles in the lungs.	Emulsion of pus from kidneys, with a trace of caseous matter from lung of Rabbit 154.	272	11 cc. [T.B. fairly numerous.]	Mar. 2, 1905.	237	K.	Trace of tuberculosis in peritoneum.														
H. 30 "E.M." *[Mesenteric glands.]*	Culture from human mesenteric and bronchial glands, through G.-P. 1137.	216	10 mg. of culture.	Dec. 20, 1904.	88	—	K.	Slight tuberculous peritonitis. Tuberculosis of lungs and kidneys.	E. of lung from Rabbit 216.	300	16 cc. [T.B. in moderate numbers.]	Mar. 18, 1905.	165	D.	Chronic tuberculous peritonitis. Slight tuberculosis of kidneys.														
H. 33. "R.T." *[Cervical glands.]*	Culture from human axillary glands direct.	192	About 50 mg. of culture.	Nov. 14, 1904.	107	—	K.	Widespread tuberculosis of chronic type.	Pus from pelvis of kidney of Rabbit 192.	268	13 cc. [T.B. fairly numerous.]	Mar. 1, 1905.	138	K when ill.	Slight chronic tuberculosis of peritoneum, lungs and right kidney.	Emulsion of lung from Rabbit 268.	523	10 cc. [T.B. rather scanty.]	July 17, 1905.	393	K.	Caseous nodules in wall of caecum. Injection possibly into the wall of the caecum.							
																	524	5 cc. [T.B. rather scanty.]	July 17, 1905.	393	K.	Trace of tuberculosis in lungs.							
									Pus from meso-colon of Rabbit 192.	269	10 cc. [T.B. numerous.]	Mar. 1, 1905.	238	K.	Trace of tuberculosis in peritoneum.	Emulsion of caseous matter from peritoneal cavity of Rabbit 269.	641	10 cc. [T.B. fairly numerous.]	Oct. 25, 1905.	289	D.	Slight tuberculosis of peritoneum, lungs, and kidneys.							
H. 22. "F.W." *[Lung]* ...	Culture from Calf 293, direct.	134	About four tube cultures.	Aug. 29, 1904.	16	—	D.	Tuberculous peritonitis. One tubercle in right kidney.	E. of omentum from Rabbit 134.	141	10 cc. rich in T.B.	Sept. 14, 1904.	160	K.	Slight tuberculosis of chronic type.	Emulsion of peritoneal abscess from Rabbit 141.	260	3 cc. [T.B. in considerable numbers.]	Feb. 21, 1905.	205	D.	Chronic progressive tuberculosis with cavities in lungs. Three large lobulated caseous tumours in abdominal cavity in which no T.B. could be found. No tubercles on peritoneum. Large prominent caseo-fibrous tubercles in lungs.							
										140	„	Sept. 14, 1904.	160	K.	Slight tuberculosis of chronic type.														
H. 45. "F.M." *[Lung]* ...	Culture derived from human bronchial glands through G.P. 1137.	133	About 2 tube cultures.	Aug. 29, 1904.	—	25	D.	Consolidation of lungs, minute tubercles in same, and many small tubercles in kidneys.	Emulsion of kidney from Rabbit 133.	145	15 cc. [T.B. in moderate numbers.]	Sept. 23, 1904.	227	K.	Very slight tuberculosis at seat of inoculation, in peritoneum, kidneys, and lungs.	Emulsion of caseous matter from kidneys of Rabbit 145.	394	12 cc. rather rich in T.B.	May 8, 1905.	157	D.	Slight tuberculosis of kidney. Trace in peritoneum.							
										146	do.	Sept. 23, 1904.	153	K.	Slight tuberculous peritonitis. Slight tuberculosis of lungs and kidneys.	Pus from pelvis of kidney from Rabbit 146.	264	10 cc. rich in T.B.	Feb. 23, 1905.	240	K.	Perfectly healthy and very fat.							
		131	„	„	115	—	K.	Slight tuberculous peritonitis. Pyelitis of both kidneys.	Caseous matter from pelvis of kidney of Rabbit 131.	222	3 cc. fairly rich in T.B.	Oct. 22, 1904.	194	K.	Trace of tuberculosis in peritoneum and kidneys.														

(From Rabbit 640.)

Fourth "Passage"—*Intraperitoneal.*

Description and Source of Tissue Emulsion used for Injection.	Number of Rabbit.	Dose.	Date.	Duration of Life in Days.	Killed or Died.	Result.
Emulsion of lung of Rabbit 640.	813	4·0 cc. moderately rich in T.B.	Mar. 15, 1906.	91	D.	Trace of tuberculosis in peritoneum, lungs, and kidneys. Cause of death unknown.

TABLE OF "PASSAGE" EXPERIMENTS ON RABBITS—*continued.*

Viruses used for the Rabbit Experiments. [The probable primary seat of disease in man is indicated in brackets.]	Primary Inoculation.								First "Passage"—*All Intraperitoneal.*							Second "Passage"—*All Intraperitoneal.*						
	Strain of Tubercle Bacilli with which the Experiment commenced.	Number of Rabbit.	Dose.	Date.	Duration of Life in Days.		Killed or Died.	Result.	Description and Source of Tissue Emulsion used for Injection.	Number of Rabbit.	Dose.	Date.	Duration of Life in Days.	Killed or Died.	Result	Description and Source of Tissue Emulsion used for Injection.	Number of Rabbit.	Dose.	Date.	Duration of Life in Days.	Killed or Died.	Result.
					Intrap.	Intrav.																
H. 25. "A.T." [*Lung*] ...	Emulsion of bronchial gland of Calf 831.	538	Small dose	July 24, 1905.	283	—	D.	Chronic tuberculous disease of kidneys.	E. of caseous material from pelvis of kidneys of Rabbit 538.	874	10 cc. [T.B. scanty.]	May 3, 1906.	103	K.	Slight tuberculosis of peritoneum and one kidney.							
H. 11. "E.D." [*Elbow joint*]	Culture derived from Calf 309, direct.	149	About 5 tube cultures.	Sept. 26, 1904.	23	—	D.	Tuberculous peritonitis. Few tubercles in lungs and kidneys.	E. of peritoneal tubercles from Rabbit 149.	176	20 cc. [T.B. numerous.]	Oct. 19, 1904.	133	K.	Some encysted collections of pus in abdomen. Slight tuberculosis of both kidneys.	Emulsion of all tuberculous tissues from Rabbit 176.	270	13 cc. [T.B. fairly numerous.]	Mar. 1, 1905.	234	K.	Trace of tuberculosis in peritoneum.
										177	10 cc. [T.B. numerous.]	Oct. 19, 1904.	201	D.	Very slight tuberculosis of peritoneum, lungs, and kidneys.							
H. 9. "C.T." [*Wrist joint*]	Culture derived from Calf 201, through G.P. 1181.	151	About 4 tube cultures.	Sept. 26, 1904.	21	—	D.	Tuberculous peritonitis. Few translucent tubercles in lungs.	E. of omentum from Rabbit 151.	174	8·5 cc. very rich in T.B.	Oct. 17, 1904.	135	K.	Minimal tuberculosis of peritoneum and lungs.							
										175	6·0 cc. very rich in T.B.	Oct. 17, 1904.	135	K.	A few translucent tubercles in lungs.							
H. 47. "S.B." [*Hip joint*] ...	Culture derived from human tissues through G.P. 1430.	414	1·0 mg. of culture.	May 22, 1905.	89	—	K.	Slight tuberculous peritonitis. Chronic tuberculosis of lungs, rather severe. Trace in kidneys.	E. of pus from uterus of Rabbit 414.	553	4 cc. very rich in T.B.	Aug. 19, 1905.	360	K.	Slight tuberculosis of peritoneum and kidneys.							
H. 16. "J.H." [*Knee joint*] ["*Passage*" *through a rat.*]	Emulsion of lesions from Rat 28, injected with a strain derived from human synovial membrane, through G.P. 609.	334	7 cc. very rich in T.B.	April 4, 1905.	220	—	K.	Slight tuberculosis of peritoneum and kidneys.														
		335	"	"	220	—	K.	Slight tuberculosis of peritoneum and lungs. Trace in one kidney.														
	Culture from Rat 28 direct.	429	0·1 mg. of culture.	May 28, 1905.	169	—	K.	Slight tuberculosis of omentum and kidneys.														
		431	10·0 mg. of culture.	"	169	—	K.	Trace of tuberculosis in peritoneum and right kidney.														

POST-MORTEM ON RABBIT 640. VIRUS H. 12. "H.N."

Died 145 days after an intraperitoneal injection.

There was a caseous lesion in the *abdominal wall* at the seat of inoculation, and one of the *axillary glands* was caseous. There were some yellow streaks on the posterior wall of the *omentum.*

Almost the whole of the anterior surface of *the liver* was covered with large tuberculous plaques, loosely attached at their margins, and adherent to the diaphragm. These were nearly $\frac{1}{4}$ inch thick, composed of tough greyish tissue, with a great many caseous patches. Between the liver and the right side of the diaphragm, and separated from the latter by one of these plaques, was a large encysted mass the size of a hen's egg of softened caseous tissue, such as one frequently sees after the injection of very large doses of non-virulent tubercle bacilli.

There were many caseo-fibrous tubercles elsewhere on the *peritoneum,* namely on the surface of the *stomach* and *cæcum,* and especially around the *spleen,* which was not enlarged, and had no tubercles in its interior.

The Kidneys were pale, but except for one or two minute points under the capsule, were free from tubercle.

The Lungs were thickly packed with a moss-like caseous network : this had a very inconspicuous grey margin. The air-containing lung tissue was scanty and bright red. The disease of the lung appeared sufficient to account for death.

Microscopical Examination.

Emulsion of lung.—Tubercle bacilli fairly numerous.

POST-MORTEM ON RABBIT 192. VIRUS H. 33. "R.T."

Killed 107 days after an intraperitoneal injection.

There were a few translucent tubercles with caseous centres scattered throughout *the peritoneum, on the vesical, falciform, and broad ligaments,* &c. In addition there were also numerous soft lobulated yellow masses, up to the size of a large shot or small pea, in both *omentums* or in the *meso-colon.* In the latter situation the largest of these masses was $\frac{1}{2}$ inch in diameter. They were composed of thick caseo-pus in a thin wall of peritoneum. *In the mesentery* irregular patches were situated in the middle of the polygonal areas into which it was divided by the blood vessels.

On the surface of *the liver* there were some fibro-caseous tubercles $\frac{1}{8}$ or $\frac{1}{6}$ inch in diameter, raised and flattened, with over-hanging margins.

The Spleen was normal.

The Kidneys contained a few tuberculous striæ, and there was some caseo-pus in the pelvis of each.

The Lungs contained widely scattered small irregular fibrous patches with yellow points.

There were two tubercles in the right side of the *heart.*

Microscopical Examination.

Emulsion of pus from pelvis of kidney.—Tubercle bacilli fairly numerous and of moderate length.

Emulsion of caseous mass from meso-colon.—Tubercle bacilli numerous, commonly in rounded masses, extremely short. No other micro-organisms.

POST-MORTEM ON RABBIT 538. VIRUS H. 25. "A.T."

Died 283 days after an intraperitoneal injection.

A very strong, fat rabbit.

There were some caseous softened collections in the posterior layer of *the omentum.*

The Kidneys were enlarged, the pelves and calyces distended, especially in the right, with an enormous quantity of softened caseous matter. The kidney substance was very tough and congested, and the surface of each organ was marked by irregular depressed areas of a bluish purple colour.

Liver and Spleen.—Normal.

There was a large hæmorrhage occupying the whole of one of the smaller lobes of the *right lung.* No tubercles were seen in the organ.

Microscopical Examination.

Emulsion of caseous material from kidney.—A few tubercle bacilli.

POST-MORTEM ON RABBIT 414. VIRUS H. 47. "S.B."

Killed 89 days after an intraperitoneal injection.

There were a moderate number of opaque tubercles in the *omentum,* but scarcely any were seen elsewhere in the *peritoneum.*

Liver and Spleen.—Normal.

One or two little tubercles were seen in each *kidney.*

The Lungs.—Were rather thickly packed with more or less confluent grey tubercles with opaque centres.

The Uterus.—Was distended with creamy pus.

Microscopical Examination.

Pus from uterus.—Swarming with tubercle bacilli.

POST-MORTEM ON RABBIT 539. VIRUS H. 25. "A.T."

Killed 373 days after an intraperitoneal injection.

Some small fibro-calcareous tubercles were seen in *the omentum.*

Liver and Spleen.—Normal.

Some caseous striæ were seen in the medulla of the right *kidney,* and a small tubercle in the apex of the pyramid of the left. There were a few fibro-caseous nodules in *the lung.*

The *right knee joint* and the *left ankle joint* were tuberculous.

VIRUS H. 16. "J.H."

Second "Passage" Experiment.

(For Chart of the first "Passage" Experiment *see* Appendix to 2nd Interim Report, Vol. II.)

CULTURE.

Derived from human synovial membrane, through G.-P. 609.

October 14, 1904.

[After 14 months' artificial cultivation.]

BULL-CALF 527.
Subcutaneous.
Dose : 50 mg.
Killed, January 12, 1905.
(90 days.)

P.M.—Small local abscess ; few caseo-calcareous foci in prescapular gland ; about 30 in mesenteric glands ; few small tubercles in small intestine.

E. of mesenteric tubercles.

E. of prescapular gland and local lesion.

RABBIT 237 [Intrap.].
Killed, 116 days.
P.M.—Trace of tuberculosis in peritoneum.

BULL-CALF 631.
Subcutaneous.
Dose : 5,014,800,000 T.B.
Killed, May 5, 1905.
(113 days.)

P.M.—Small local ulcer ; caseo-calcareous patches in prescapular gland.

E. of prescapular gland.

RABBIT 389 [Intrap.].
Killed, 192 days.
P.M.—Trace of tuberculosis in omentum.

BULL-CALF 753.
Subcutaneous.
Dose : 14,490,000 T.B.
Killed, August 9, 1905.
(96 days.)

P.M.—Few calcareous grains at seat of inoculation ; one yellow focus in prescapular gland.

EXPERIMENT CLOSED.

VIRUS H. 17. "Sp.B."

Second "Passage" Experiment.

(For Chart of the first "Passage" Experiment *see* Appendix to 2nd Interim Report, Vol. II.)

CULTURE.

Derived from Calf 339, through G.P. 1235.

February 28, 1905.

[after 8 months' artificial cultivation.]

COW-CALF 685.

Intravenous.

Dose : 10·0 mg.

Killed : May 3, 1905. (64 days.)

P.M.—Pea-sized lesion in wall of vein; moderate number of tubercles (up to one-eighth inch) in lungs. No T.B. found in emulsion of thoracic glands and very few in emulsion of lung tubercles.

RABBIT

injected intraperitoneally with E. of lung tubercles.

Number.	Duration of Life.	Result.
380	K. 191 days	Normal throughout.

RABBITS [Intrap.].

Number.	Dose.	Duration of Life.	Result.
265	50·0 mg.	D. 73 days	Trace of tuberculosis in left kidney; death from pneumonia.
266	10·0 mg.	K. 91 „	Very slight tuberculous peritonitis; few tubercles in lung and kidney.
267	1·0 mg.	K. 91 „	Slight tuberculosis of peritoneum and lungs.

Experiment failed.
Insufficient material to pass on.

Third "Passage" Experiment.

CULTURE.

As above.

May 26, 1905

[after 11 months' artificial cultivation.]

BULL 607.

Intravenous.

Dose : 90·0 mg.

Killed : July 13, 1905.

(48 days.)

P.M.—Small caseous tumour outside wall of vein at seat of inoculation. A good many small tubercles in kidneys. The lungs appeared somewhat indurated, but contained no tubercles; no T.B. were found in them, nor in the thoracic glands, liver, or spleen, and only two T.B. were seen in a preparation from the kidney tubercles.

RABBITS [Intrap.].

Number.	Dose.	Duration of Life.	Result.
424	10·0 mg.	D. 5 days	Psorospermosis.
425	10·0 mg.	D. 17 „	Early tuberculous peritonitis; death from other causes.
426	27·5 mg.	K. 171 „	Slight tuberculosis of peritoneum and kidneys.

This experiment also was stopped for same reason.

VIRUS H. 8. "S.C."

First "Passage" Experiment.

CULTURE.

Derived from human mesenteric glands, direct.

July 10, 1903.

CALF 177.
Subcutaneous.
Dose : 3,000 milligrammes of bacilli from broth culture. Killed : September 2, 1903. (54 days.)
P.M.—Softened local lesion ; prescapular gland slightly affected.

G.P.'s 763-766.
G.P.'s 849-852.
G.P.'s 912-915.

December 21, 1903.

CALF 305.
Intravenous.
Dose : 728,879,000 T.B.
Killed when very ill : January 16, 1904.
(26 days.)
P.M.—Early general tuberculosis.

CALF 303.
Subcutaneous.
Dose : 809,869,000 T.B.
Killed : April 13, 1904.
(114 days.)
P.M.—Minimal local lesion ; calcareous nodules in prescapular gland.

E. of thoracic gland.

CALF 275.
Subcutaneous.
Dose : 12,550,000 T.B.
Killed : March 15, 1904.
(59 days.)
P.M.—Small local lesion ; caseous nodules in nearest glands. Few yellow foci in thoracic glands.

RABBIT. [Intrap.]

Number.	Duration of Life.	Result.
36	K. 132 days	Small lesion at seat of inoculation. One small tubercle in each lung.

E. of local lesion.

CALF 361.
Intravenous.
Dose : 41,550,000 T.B.
Killed : May 30, 1904.
(76 days.)
P.M.—General miliary tuberculosis.

E. of thoracic glands.

CALF 419.
Subcutaneous.
Dose : 6,146,000 T.B.
Killed : September 1, 1904.
(94 days.)
P.M.—Minimal local lesion ; yellow in prescapular gland.

CALF 423.
Subcutaneous.
Dose : 6,146,000 T.B.
Killed : September 1, 1904.
(94 days.)
P.M.—Small local lesion ; caseo-calcareous nodules in nearest glands. Two minute foci in posterior thoracic gland.

EXPERIMENT CLOSED.

VIRUS H. 22. "F.W."

First Intravenous "Passage" Experiment

Strain derived from Calf 291, through G.P. 1200.

May 4, 1904.

E. of lesions from G.P. 1200.

CALF 399.

Intravenous.

Dose : 719,733,000 T.B.

Killed : June 7, 1904, when very ill.
(34 days.)

P.M.—Tuberculous lobular pneumonia : no visible tubercles, but T.B. numerous almost everywhere.

RABBITS.

Number.	Method.	Duration of Life.	Result.
81	Intrap.	K. 114 days	Slight tuberculous peritonitis. One or two translucent tubercles in lungs.
82	Intrav.	D. 84 „	Tuberculous pyelitis of both kidneys.

E. of thoracic glands.

CALF 457.

Intravenous.

Dose : 20,000,000 T.B.

Died : August 3, 1905. (57 days.)

P.M.—Miliary tuberculosis of lungs. Caseation of thoracic glands. Intestines and mesenteric glands affected.

RABBITS.

Number.	Method.	Duration of Life.	Result.
98	Intrap.	D. 51 days	One or two tubercles in lungs and kidneys. Death due to septic peritonitis.
99	Intrav.	K. 65 „	Slight tuberculous peritonitis. Grey tubercles in lungs and kidneys.

E. of bronchial gland.

CALF 505.

Intravenous.

Dose : 11,150,000 T.B.

Killed : October 4, 1904. (62 days.)

P.M.—Three minute tubercles in lungs. A considerable number of yellow calcareous grains in thoracic glands.

RABBITS.

Number.	Method.	Duration of Life.	Result.
117	Intrap.	K. 91 days	Almost normal.
118	Intrav.	K. 91 „	Very slight tuberculous peritonitis of lungs and kidneys.

Experiment closed. Insufficient material to pass on.

VIRUS H. 22. "F.W."—*continued.*

Second "Passage" Experiment.

CULTURE.

Derived from Calf 293 direct.

May 3, 1905.

[After 14 months artificial cultivation.]

BULL-CALF 749.

Intravenous.

Dose : 46 mg.

Killed, when very ill, May 27, 1905. (24 days.)

P.M.—Lungs extensively consolidated—no visible tubercles. Caseation of thoracic glands.

RABBITS [Intrap.].

Number.	Dose.	Duration of Life.	Result.
381	50·0 mg.	K. 68 days	Slight tuberculosis of peritoneum, lungs and kidneys.
382	10·0 mg.	K. 90 „	Slight tuberculosis of peritoneum and kidneys. Trace in lungs. Uterus distended with tuberculous pus.
383	1·0 mg.	K. 90 „	Slight tuberculosis of peritoneum and kidneys.
384	0·1 mg.	K. 90 „	Slight tuberculosis of peritoneum and lungs. Trace in kidney.

E. of thoracic glands.

BULL-CALF 811.

Intravenous.

Dose : 250,000,000 T.B.

Killed : July 15, 1905. (49 days.)

P.M.—Perivascular tumour at seat of inoculation. No tubercles in lungs. Some caseous foci in thoracic glands.

RABBITS [Intrap. Dose : 10,000,000 T.B.]

Number.	Duration of Life.	Result.
427	K. 88 days	Slight tuberculosis of lung. Trace in peritoneum and right kidney.
428	K. 88 „	Very slight tuberculosis of lung. Trace in peritoneum and kidneys.

BULL-CALF 817.

Intravenous.

Dose : 890,880,000 T.B.

Killed : August 15, 1905. (31 days.)

P.M.—Some tubercles in heart and vena cava superior. Lungs extensively mottled with irregular foci. Few T.B. in these and none in other organs.

RABBIT [Intrap.].

Number.	Duration of Life.	Result.
522	K. 39 days (Spine broken)	Commencing tuberculous peritonitis.

GUINEA-PIG [Intrap.].

Number.	Duration of Life.	Result.
508	D. 34 days	G. T.

Experiment closed.

VIRUS H. 25. "A.T."

Second "Passage" Experiment.

CULTURE.

Derived from Calf 417, direct.

JUNE 16, 1905.

[After 10½ months artificial cultivation.]

BULL 551.

Intravenous.

Dose : 100 mg.

Died : July 7, 1905.

(21 days.)

P.M.—Lungs consolidated. Thoracic glands enlarged ; in an early stage of caseation. Few T.B. in films from liver and spleen.

RABBITS [P.].

Number.	Dose.	Duration of Life.	Result.
479	50·0 mg.	Killed 116 days.	Trace of tuberculosis in peritoneum, lungs and left kidney.
476	10·0 mg.		Trace of tuberculosis in peritoneum and one kidney.
477	1·0 mg.		Slight tuberculosis of lungs.
478	0·1 mg.		Trace of tuberculosis in peritoneum and one kidney.

E. of post-thoracic gland.

BULL-CALF 831.

Intravenous.

Dose : 999,600,000 T.B.

Died : July 24, 1905.

(17 days.)

P.M.—Numerous minute tubercles in heart. T.B. in all organs, and in all glands examined. Death from intestinal trouble.

RABBIT [P.].

Number.	Duration of Life.	Result.
517	Killed, 320 days	Trace of tuberculosis in peritoneum.

E. of right bronchial gland.

BULL-CALF 859.

Intravenous.

Dose : 2,044,700,000 T.B.

Died : August 12, 1905.

(19 days.)

P.M.—Numerous minute tubercles in right side of heart. Lungs almost entirely consolidated ; no definite tubercles. No visible change in abdominal organs.

RABBITS [P.].

Number.	Duration of Life.	Result.
537	Died, 3 days	Psorospermosis.
538	Died, 283 „	Death from chronic tuberculous disease of kidneys.

E. of thoracic gland.

BULL-CALF 861.

Intravenous.

Dose : 345,906,000 T.B.

Killed (very ill) : September 11, 1905.

(30 days.)

P.M.—Lungs heavy and partly consolidated ; no definite tubercles. Thoracic glands enlarged ; no tubercles. T.B. very scanty.

G.-P.'s injected with E. of thoracic gland.

Number.	Duration of Life.	Result.
727	Died, 47 days	G. T.
28	Died, 46 „	G. T.
729	Died, 15 „	T.

RABBITS [P.].

Number.	Duration of Life.	Result.
539	Killed, 374 days	Slight tuberculosis of peritoneum, lungs and kidneys. Tuberculosis of knee and ankle joint.
540	Killed, 374 „	Trace of tuberculosis in peritoneum.

VIRUS H. 25. "A.T."

First "Passage" Experiment.

Strain derived from human lung, through G.-P. 1282.

June 1, 1904.

E. of lesions from G.-P. 1282.

CALF 449.
Subcutaneous.
Dose : 87,273,000 T.B.
Killed : August 5, 1904.
(65 days.)

P.M.—Small local lesion, nearest glands caseo-calcareous. Small foci in thoracic and several peripheral glands

E. of prepectoral gland.

CALF 467.
Intravenous.
Dose : 11,248,000 T.B.
Killed : October 6, 1904.
(62 days.)

P.M.—One or more minute tubercles in lungs, liver, spleen; numerous calcareous grains in thoracic glands, fewer in hepatic and right prescapular glands.

Experiment closed.

RABBIT 120 [Intrap.].
Killed : 97 days.

P.M.—Tuberculous peritonitis, very slight.

VIRUS H. 23. "J.P."

First "Passage" Experiment.

Emulsion of human lung.

March 19, 1905.

CALF 345.

Subcutaneous.

Dose : 103,093,000 T.B.

Killed: June 6, 1904.

(79 days.)

P.M.—Small local lesion ; caseating nodules in prescapular gland.

E. of prescapular gland.

CALF 441.

Intravenous.

Dose : 13,357,000 T.B.

Killed : September 16, 1904.

(102 days.)

P.M.—Generalized tuberculosis, not severe, calcareous and probably retrogressing. T.B. were not numerous in any of the lesions examined.

Experiment closed.

Report (Submitted to the Commission in 1906) on Experiments with Mixed Viruses

H. 8. "S.C." (GROUP II.) and H. 10. "B.S." (GROUP I.), &c.

WHEN GROWN

(1) In Artificial Culture.
(2) In the Body of a living Animal.

BY

DR. L. COBBETT.

THE FATE OF MIXED VIRUSES.

Submitted to the Commission, July, 1906.

It was thought desirable to investigate experimentally the fate of mixtures of different kinds of tubercle bacilli for the following reasons.

In some experiments, detailed in the report on "The stability of virulence of tubercle bacilli in the living animal," a series of injections were made from calf to calf, starting with a virus belonging to our Group II.; and the strains of bacilli derived from the latter animals were different in cultural characters and specific virulence from those used at the commencement. This may, of course, have been the result of a modification of the bacilli in the body of a new animal host; but, on the other hand, it is possible that one had to do with a mixture of tubercle bacilli of the human and bovine types either from the commencement or at some stage of the experiment; and that the apparent modification resulting from a series of passage experiments, might after all be due to the elimination of one component of such a mixture of bacilli.

The hypothesis that in these cases one might have to do *at the outset* with a mixture of two kinds of tubercle bacilli arose out of the suggestion that the bovine bacillus might get access to the lesions caused by the human bacillus in man, and continue to live in them as "a harmless lodger"; that, for example in a case of tuberculous ulceration of the intestine, bacilli contained in milk given as food might not unreasonably be expected to get into the tuberculous lesions, and possibly travel to the mesenteric glands or even further. In such a case an emulsion of, or a culture from, the tubercles might contain the bovine tubercle bacillus as well as the human (and therefore be virulent for the ox and rabbit) and yet the bovine bacillus be not the original cause of the lesions in the man.

The questions then which arose out of this consideration, and which it seemed desirable to investigate, were—

(1) Could evidence of virulence for the ox be trusted to prove that the lesions from which the infective material was obtained not only harboured but was caused by a bacillus virulent for the ox, that is, by the bovine bacillus; and (2) would the cultural characters of a strain of bacilli raised from this virulent material tell us whether or no the less virulent and eugonic human tubercle bacillus (Group II.) was absent, or present along with the bovine bacillus?

It was for these reasons very desirable to know more of the fate of mixed bovine and human tubercle bacilli both in the living animal and in culture, and since it was not permissible to use bacilli of bovine origin at Blythwood Farm it was decided to investigate the fate of mixtures of the bovine type of tubercle bacillus obtained from man, together with bacilli of the so called human type, that is the type commonly obtained from man, and which grows well on glycerin media and which is not virulent for the ox and rabbit.

For these experiments the virus H. 10 "B.S." was chosen as a typical example of the former, and H. 8. "S.C." as an equally typical example of the latter.

FATE OF MIXED VIRUSES IN ARTIFICIAL CULTURES.

The strains selected were (1) that obtained sixteen months previously, indirectly, from the human mesenteric glands of B.S. through the guinea-pig (it was then in its 12th generation of culture); and (2) that obtained directly from the mesenteric glands of S.C. more than two years earlier, and then in its 17th generation of culture.

The comparative virulence of these strains for calves and rabbits was redetermined and each found to correspond exactly to its class. Each was then sown on various media to determine the cultural characters as they then existed. It was thus found that each strain exhibited in a satisfactory manner the typical cultural characters of dysgonic and eugonic bacilli respectively. On pure serum they grew very similar to one another while on glycerin media the contrast was marked. On glycerin-serum, for example, B.S. at that time grew better then it had done when freshly isolated, and indeed as well as it did on pure serum. S.C., on the other hand while it grew no better than B.S. on pure serum, grew much more luxuriantly on glycerin serum, and rapidly formed large raised cream-coloured nodules. *It was obvious then that if each of these strains were to be grown mixed together and one did not interfere with the other, S.C. would have little if any advantage over B.S. as long as pure serum was the culture medium, but that it would have a very considerable advantage on glycerin-serum.*

Mixed cultures of these two strains were then sown with equal quantities of each upon (1) pure serum and (2) glycerin-serum, and a series of cultures on each of these media started, the cultures being resown once a month.

The first thing that was noticed was that these mixtures grew like cultures of S.C. alone; on glycerin media they were luxuriant, and yet bacilli belonging to the strain B.S. were present, as was shown by the result of injecting rabbits. *Mixtures then of eugonic and dysgonic bacilli grow like eugonic bacilli alone, the dysgonic bacilli being present also, but imparting no character to the appearance of the cultures by which they might be suspected.*

The next thing to determine was whether in a series of cultures started from such mixtures the dysgonic bacilli would persist, and if so for how long?

On pure serum a series of cultures was maintained for nine generations, and during a period of nine months. Six of these generations, including the last, were tested as to their virulence for the rabbit. All proved virulent for this species, producing fatal tuberculosis in a few weeks. All these nine generations of culture on pure serum contained along with the eugonic bacilli of the Group II. (human) strain, the dysgonic bacilli of the Group I. (bovine) strain, which alone are virulent to rabbits.

H. 8. "S.C." (HUMAN TYPE, OR GROUP II.) AND H. 10. "B.S." (BOVINE TYPE, OR GROUP I.).

Mixed Virus.

Immediate source of cultures used in the experiment:

H. 8. "S.C.": Original material (human mesenteric glands). Strain $2\frac{1}{3}$ years old.

H. 10. "B.S.": Calf 113, through G.P. 757. Strain 1 year 4 months old.

Serum Series. [Controls.]

Subcultures 3 weeks old. **Rabbits injected intraperitoneally.**

DOSE: 10 MILLIGRAMMES.

Number of Generations of the Mixed Culture.	Date.	Number of Rabbit.	Killed or Died.	Duration of Life in Days.	Result.
1st on serum	April 5, 1905	336	Died	27	General tuberculosis.
		337	„	25	General tuberculosis.
2nd on serum	April 18, 1905	360	„	20	General tuberculosis.
		361	„	86	General tuberculosis. (Nothing to account for prolonged illness.)
3rd on serum	May 4, 1905	385	„	27	General tuberculosis.
		386	„	36	General tuberculosis.
4th on serum	May 24, 1905	422	„	16	General tuberculosis.
		423	„	26	General tuberculosis.
5th on serum	June 11, 1905	470	„	19	General tuberculosis.
		471	„	28	General tuberculosis.
9th on serum	December 5, 1905.	703	„	38	General tuberculosis.
		704	„	21	General tuberculosis, not severe. Death probably due to other causes.

Glycerin-Serum Series.

Subcultures 3 weeks old. **Rabbits injected intraperitoneally.**

DOSE: 10 MILLIGRAMMES.

1st on glycerin-serum ...	April 5, 1905	338	Died	71	General tuberculosis of chronic type.
		339	„	101	Chronic tuberculosis, particularly affecting lungs.
2nd on glycerin-serum ...	April 18, 1905	362	„	97	Severe tuberculosis of chronic type affecting peritoneum and lungs, and kidneys (less severely). Injection (?) partly intracœcal.
		363	„	40	Slight tuberculous peritonitis. Severe tuberculosis of lungs and kidneys.
3rd on glycerin-serum ...	May 4, 1905	387	Killed	124	Chronic tuberculosis of peritoneum, lungs and kidneys, of the perlsucht type.
		388	„	124	Trace of tuberculosis in peritoneum. Tuberculosis of kidneys and lungs, the latter severely affected.
4th on glycerin-serum ...	May 18, 1905	399	Died	146	Tuberculosis of lungs. Trace in peritoneum and kidneys.
		400	Killed	179	Trace of tuberculosis in omentum and kidneys.
5th on glycerin-serum ...	May 31, 1905	440	Died	141	Chronic general tuberculosis.
		441	Killed	166	Slight tuberculosis of lungs. Trace in peritoneum.
6th on glycerin-serum ...	June 14, 1905	472	Died	32	Slight tuberculous peritonitis in very small animal. Cause of death not determined.
		473	„	117	Trace of tuberculosis in peritoneum. Death from other causes.
On serum (after 5 on glycerin-serum).	June 14, 1905	474	„	67	Very slight tuberculous peritonitis. Trace in lungs and right kidney. Death from other causes.
		475	Killed	152	Trace of tuberculosis in peritoneum and kidneys.
10th on glycerin-serum...	November 14, 1905.	688	„	136	Trace of tuberculosis in peritoneum.
		689	„	136	Chronic tuberculous peritonitis.
On serum (after 9 on glycerin-serum).	November 14, 1905.	686	„	136	Trace of tuberculosis in peritoneum and kidneys.
		687	„	136	Trace of tuberculosis in peritoneum and one kidney.
11th on glycerin-serum...	December 5, 1905.	705	„	115	Trace of tuberculosis in omentum and one kidney.
		706	„	115	No tuberculosis.

On glycerin-serum the fate of the mixtures was quite otherwise. These went through eleven generations in the course of nine months. All the cultures were injected when three weeks old into rabbits, in 10 mg. doses. A large dose was chosen, because, while it was confidently held that even this quantity of S.C. bacilli could not cause death or progressive tuberculosis in these animals, it was thought more likely to reveal traces of the virulent B.S. bacilli if they were present.*

The first culture injected caused chronic progressive tuberculosis, both animals dying after several months. The virulent bacilli then were present, but probably in very small numbers.

The elimination of the bacilli virulent for the rabbit, although carried so far in the first culture on glycerin-serum, was not speedily completed, and traces of them remained for five generations, as was shown by the production of more or less progressive tuberculosis in rabbits injected with them. The elimination, however, became complete by the sixth generation, and rabbits injected with this as well as with the tenth and eleventh generations remained well for several months, and when killed were found to have only the minimal retrogressive lesions characteristic of the bacilli of S.C.

Thus the dysgonic (virulent) bacilli disappeared from the mixture when grown on a medium—glycerin-serum—which greatly favours eugonic bacilli (not virulent for rabbits) over dysgonic bacilli. The elimination was carried a long way in the first culture; but was not completed until several more generations had been grown. Why was it so rapid at first; so slow later?

A series of cultures of B.S. only on glycerin-serum was made to control the above. Though dysgonic at first, *i.e.*, growing badly on glycerin-serum, this strain rapidly adapted itself to the new soil, and after several generations grew almost like a typical eugonic strain. Hence in consequence of their ability to adapt themselves to glycerin media, the bacilli B.S. found themselves at a progressingly diminishing disadvantage as compared with those of S.C. in succeeding cultures. And it is conceivable that they might never have died out completely had they been less dysgonic at the start, or able to adapt themselves a little more readily.

In the next series of experiments with a mixture grown on glycerin media, the virulent dysgonic element was not completely eliminated in six generations.

H. 9. "C.T." (HUMAN TYPE, OR GROUP II.) AND H. 14. "F.S." (BOVINE TYPE, OR GROUP I.).

Mixed Virus.

First Mixed Culture Sown on January 17, 1905.

Immediate source of cultures used in the experiment:

H. 9. "C.T.": Calf 201, through G.P. 1,081. [4th Subculture. Strain 8 months old.]

H. 14. "F.S.": Calf 327, through G.P. 1,106. [3rd Subculture. Strain 7½ months old.]

GLYCERIN-SERUM SERIES.

Rabbits Injected Intraperitoneally.

No. of Generation of the Mixed Culture.	Date.	Number of Rabbit.	Dose in Milli-grammes.	Killed or Died.	Duration of Life in Days.	Result.
On serum, after 5 generations on glycerin-serum. (5 weeks old sub-culture used for injection.)	Sept. 2, 1905.	589	10·0	Died	17	General tuberculosis.
		590	10·0	,,	12	General tuberculosis.
		587	1·0	Killed	72	Chronic tuberculosis of lungs and kidneys. (Injection intramuscular.)
		588	1·0	Died	25	General tuberculosis.
On serum, after 6 generations on glycerin-serum. (3 weeks old sub-culture used for injection.)	Nov. 8, 1905.	674	10·0	,,	24	General tuberculosis.
		675	10·0	,,	19	General tuberculosis.
		676	1·0	,,	25	General tuberculosis.
		677	1·0	,,	26	General tuberculosis complicated by other disease.

In both of the experiments just described the series of mixed cultures on glycerin media diminished its virulence for the rabbit, and in the case of the first, ultimately lost it. How, it may be asked, is it certain that this was due to elimination and not to attenuation? In the report on the stability of virulence of tubercle bacilli (*see page* 299) there is collected much evidence of the great stability of virulence of tubercle bacilli in general and a complete refutation of the suggestion that glycerin in the culture medium causes attenuation. Moreover, the virulence of a series of cultures of the strain B.S. itself on glycerin-serum was tested in order to form a control to the experiments with mixture. The series went through ten generations of culture on glycerin-serum, and its virulence was maintained unaltered to the end; even so small a dose as ·01 mg. of the last culture proving fatal to two rabbits in five or six weeks. The table of these experiments is reprinted here for convenience of reference. *These experiments show the possibility of separating tubercle bacilli of the human type from mixtures of bacilli of the bovine and human types by a series of cultivations on glycerin media; but they show also that this method succeeds only when the cultural characters of the bovine type of bacillus are markedly dysgonic.*

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* It must be remembered that very minute doses of tubercle bacilli belonging to Group I. suffice to cause fatal tuberculosis in the rabbit.

VIRUS H. 10. "B.S."

Rabbits Injected Intraperitoneally.

CULTURE DERIVED FROM CALF 113, THROUGH G.P. 757.

[Strain 16½ months old at commencement of experiment.]

CULTURES ON PURE SERUM (BOVINE).

Culture 3 weeks old, sown February 22, 1905, from pure Serum Culture. Inoculated March 15, 1905.

Number of Rabbit.	Dose in Mg.	Killed or Died.	Duration of Life in Days.	Result.
298	10·0	Died	21	G.T.
297	1·0	,,	23	G.T.
296	0·1	,,	44	G.T.
295	0·01	,,	78	G.T.

Sown May 17, 1905, on Serum, from the 3rd Culture on Glycerin-serum. Inoculated June 7, 1905.

452	10·0	Died	37	G.T. (Injection partly intramuscular.)
453	1·0	,,	13	G.T. Death perhaps hastened by psorospermosis.
454	1·0	,,	28	G.T.
455	0·1	,,	92	Chronic T. of lungs. (Injection intracœcal.)

Sown June 30, 1905, on Serum, from the 5th Culture on Glycerin-serum. Inoculated July 21, 1905.

525	10·0	Died	73	G.T. (Injection probably partly intracœcal.)
526	1·0	,,	53	G.T.
527	1·0	,,	21	G.T.
528	0·1	,,	1	Death due to psorospermosis.

Sown August 7, 1905, on Serum, from the 7th Culture on Glycerin-serum. Inoculated August 28, 1905.

555	10·0	Died	19	G.T.
556	10·0	,,	17	G.T.
557	1·0	,,	24	G.T.
558	1·0	,,	28	G.T.

Sown October 24, 1905, on Serum, from the 9th Culture on Glycerin-serum. Inoculated November 14, 1905.

682	10·0	Died	80	G.T. (Injection partly subcut.)
683	1·0	,,	29	G.T. Not very severe.
684	0·1	,,	29	G.T.
685	0·01	,,	43	G.T. (Injection partly intracœcal.)

CULTURES ON 5 PER CENT. GLYCERIN-SERUM (BOVINE).

Culture 3 weeks old, sown April 27, 1905, from the 1st Culture on Glycerin-serum. Inoculated May 18, 1905.

Number of Rabbit.	Dose in Mg.	Killed or Died.	Duration of Life in Days.	Result.
401	10·0	Died	17	G.T.
402	1·0	,,	39	G.T. (Injection partly sub-peritoneal.)
403	0·1	,,	26	G.T.

Sown October 24, 1905, on Glycerin-serum, from the 9th Culture on the same medium. Inoculated November 14, 1905.

678	10·0	Died	16	Early G.T.
679	1·0	,,	21	G.T.
680	0·1	,,	25	G.T.
681	0·01	,,	38	G.T.

FATE OF MIXED VIRUSES IN THE LIVING ANIMAL.

The fate of mixed viruses in the living animal was investigated by injecting rabbits and calves with mixtures of strains of tubercle bacilli belonging to the human Groups I. and II. (*i.e.* human and bovine types of tubercle bacilli, each derived from man) and then studying the cultural characters of new strains derived from the metastatic lesions which developed in the animals; it being held that if these were distinctly eugonic one might conclude that the eugonic element (which has but slight virulence for the ox and rabbit) of the mixture had reached a metastatic lesion caused by the dysgonic (virulent) element.

FATE OF MIXED VIRUSES IN THE RABBIT.

Experiment with H. 33. "R.T." and H. 32. "Y.W."

Rabbit 257 received on January 21, 1905, an intraperitoneal injection of 10 mg. of a mixed culture on glycerin-serum. This had been sown first with H. 32. "Y.W." (dysgonic type) on December 31, 1904, from the 5th serum culture derived directly from the human mesenteric glands, and 10 days later it was again sown, this time from the 7th serum culture of of H. 33 "R.T." (eugonic type) derived directly from human axillary glands.

After the culture had been allowed to grow for 28 days after the last sowing, and when it was growing luxuriantly in the manner of H. 33. "R.T." it was injected.

The rabbit died of general tuberculosis 48 days later, and cultures were sown from the lung, and from the marrow of one of the ribs.

It will be remembered that tubercle bacilli of the kind to which H. 33. "R.T." belongs frequently cause unimportant lesions in the lungs of rabbits, but have seldom if ever been known to cause lesions in the liver, spleen, or bone marrow; while those of the H. 32. "Y.W." kind constantly cause general tuberculosis in these animals. Consequently, it would be less surprising to find tubercle bacilli of the "R.T." kind in the lungs of a rabbit injected with a mixture, than in the marrow or spleen.

This particular experiment turned out according to anticipation. A clear difference soon showed itself between the two sets of cultures. Those from the lung cultures grew luxuriantly on glycerin-serum and on glycerin-agar, just as H. 33. "R.T." had done. The rib cultures, on the other hand, grew no better on serum, with glycerine than without. Sown from glycerin-serum on to the same medium its growth did not increase, and the strain retains its dysgonic characters down to the present time (July, 1906).

There can be little doubt, therefore, that in this case the non-virulent eugonic H. 33. "R.T." either did not reach the bone marrow, or could not live there, while it gained access to the lung along with the dysgonic virulent H. 32. "Y.W." and remained alive there until the animal died on the 48th day. *The less virulent element therefore does not necessarily always accompany the more virulent element of an injected mixture wherever the latter goes.*

Experiment with "S.C." and "B.S."

Rabbit 336 received on April 5, 1905, an intraperitoneal injection of 10 mg. of a serum culture, sown 21 days before with equal parts of "S.C." and "B.S."

It died 27 days later with general tuberculosis. Cultures were sown from the bone marrow of a rib, and from the lung.

The culture from the marrow grew rapidly and well on the primary serum culture, and in subculture on glycerin-serum grew large raised cream-coloured but not confluent colonies—that is like "S.C." and unlike "B.S." The cultures from the lung also grew well on glycerin-serum, but a culture on serum-agar failed. There is evidence, then, that in this animal "S.C." reached the bone marrow as well as the lung.

Rabbit 337 received an injection similar to the above, and at the same time. It died of general tuberculosis 27 days later. Cultures were sown from the mesentery, marrow and sternal gland. Those from the mesentery were intended to act as controls to the others, for it was held that "S.C." would be certainly recovered along with "B.S." from the peritoneum.

All three cultures grew large raised cream-coloured colonies on glycerin-serum. These did not fuse together to any great extent, nor did the growth mount up the side of the glass, but this was probably because there was very little excess of fluid in the tubes. There was no difference between the three sets of cultures. All, in fact, grew just like "S.C." and unlike "B.S." and there can, I think, be no reasonable doubt that in this animal, as in the last, the non-virulent eugonic "S.C." reached the marrow of the ribs and the sternal glands.

Rabbit 299 received on March 15, 1905, an intraperitoneal injection of 5 mg. of "S.C." and 5 mg. of "B.S." grown separately on pure serum for 21 days. It died of general tuberculosis 16 days later. Cultures were sown from the lung and from the marrow of a rib.

The primary culture from the lung grew on glycerin-serum with a thick, wrinkled, cream-coloured film, and in subsequent cultures it always grew luxuriantly on that medium (with the exception of a batch of tubes of serum from Cow 95, on which other eugonic cultures failed to develop characteristic growths).

Of two broth cultures from the lung, one was very fairly eugonic, the other only moderately so.

A litmus milk glycerin culture grew fairly well, and ended more acid than it began.

The primary culture from the marrow grew well on serum (it is not recorded whether a primary serum glycerin culture was sown or not). In the first subculture of glycerin-serum it grew in large thick, whitish colonies, with raised and nodular margins (eugonic). Then followed a number of cultures on the unsatisfactory serum of Cow 95. And finally, some cultures sown in June from the primary culture of March 31. One of these, on glycerin-serum, grew in a continuous cream-coloured nodular film. The other was not quite so characteristic.

A broth culture grew a continuous film, but it was of the smooth ground glass kind, and not characteristically eugonic. A litmus milk glycerin culture however grew very well, like H. 9. "C.T." Calf 201, and ended distinctly more acid than it began.

It is fairly certain, therefore, that in this case also the eugonic non-virulent "S.C." was found in the rib marrow.

Thus in three out of four instances where a rabbit was injected with a mixture of dysgonic bacilli which are virulent for its species, and eugonic bacilli which are only slightly so, the latter were found (no doubt along with the former) in the metastatic lesions, not only in the lung, but also in the bone-marrow.

The evidence of this was based on the cultural characters of the strains of bacilli raised from these lesions. But in order to put the evidence on a wider and more objective foundation another method was used in addition.

It has already been stated that when a mixture of virulent (for calves and rabbits) dysgonic bacilli, which grow badly on glycerin media, are grown along with non-virulent (for these animals) eugonic bacilli which grow luxuriantly on these media, the former are placed at a disadvantage, and rapidly tend to disappear from the mixture, until at last only the non-virulent eugonic bacilli may remain.

That this is a true elimination and not an attenuation was shown by the fact that "B.S," as well as many other pure strains are not attenuated when grown for many generations on glycerin media.

These results suggested a method which may be applied to answer the question, as in the present case, whether a non-virulent bacillus is existing in a culture side by side with a virulent bacillus; for if after growing for several generations on glycerin-serum the strain should be found non-virulent for rabbits, since one cannot admit that it has been attenuated, one can only conclude that a non-virulent element was originally contained in the strain and that this alone has been left.

In accordance with the reasoning a culture from the rib-marrow of Rabbit 299 was grown for three generations on glycerin-serum, and finally on pure serum. This last culture when three weeks old was injected into the peritoneal cavity of rabbits as follows:—

STRAINS OF CULTURE DERIVED FROM THE RIB MARROW OF RABBIT 299.

Glycerin-Serum Series.

Sub-culture three weeks old. Rabbits inoculated intraperitoneally.

—	Total Duration of Artificial Cultivation.	Medium on which Final Culture was Grown.	Dose in Milli-grammes.	Number or Rabbit.	Killed or Died.	Duration of Life in Days.	Result.
Grown for 3 generations on glycerin-serum media.	8½ months	Pure serum	10·0	731	Killed	109 days	Slight tuberculosis of peritoneum. Trace in lungs.
			10·0	732	Killed	109 days	Trace of tuberculosis in peritoneum and kidneys.
			1·0	733	Killed	109 days	Trace of tuberculosis in peritoneum.
			1·0	734	Killed	109 days	Trace of tuberculosis in peritoneum and kidneys.

As will be seen from the accompanying table the results of these injections were in all cases minimal; not even did the very large dose of 10 mg. cause general or progressive tuberculosis. Indeed, the result clearly demonstrated that after three generations of growth on glycerin-serum, only a bacillus incapable of seriously infecting rabbits was left, and there can be no reasonable doubt from what has gone before that this was the Group II. strain "S.C." and therefore the conclusion may be held to be confirmed, namely, that *bacilli of Group II. may be found in metastatic lesions caused by other tubercle bacilli, after injection of both kinds of bacilli into animals in which the former kind are incapable of producing such lesions. But they are not necessarily found in these lesions* as the experiment with H. 33. "R.T." and H. 32 "Y.W." showed.

This conclusion is, of course, not a surprising one, seeing how wide spread (though not progressive) are the lesions produced by bacilli of Group II. in this species. And remembering too that in the even more highly resisting calf bacilli of this kind become universally distributed after an injection.

FATE OF MIXED VIRUSES IN THE CALF.

For these experiments the strains used were "S.C." and "B.S.," the same which had been employed for determining the fate of mixed viruses in artificial culture; and the first calves were injected with the actual cultures used for sowing the first tubes of the mixed culture series.

On March 15, 1905, two calves were subcutaneously injected, each with 50 mg. of "B.S." and 50 mg. of "S.C.": serum cultures which had been grown 21 days. In the case of Calf 689 the "S.C." and the "B.S." bacilli were mixed and injected together subcutaneously on the right side of the neck. In Calf 649 the two kinds of bacilli were injected separately, one on each side of the neck.

Calf 689 became very ill and was killed on May 2—48 days after injection. It was found to have general tuberculosis, but the great organs, other than the lungs, were not affected severely.

Another calf (757) was then injected subcutaneously with an emulsion made of the lung of 689.

From Calf 689 cultures were grown from (1) the prescapular gland (this as a control to the rest); (2) the long thoracic gland; (3) the spleen; and (4) the lung. The first three were obtained direct from the organs from the calf, but the fourth failed, and had to be recovered from a guinea-pig which had been injected with a lung emulsion.

These strains as well as others from other animals injected for a similar purpose were studied through many generations on various media. Somewhat unfortunately there were so many of them that it was difficult or impossible to find the time, amid the many other pressing claims of the Blythwood laboratory, for the through study of their cultural characters. And many opportunities of following up strains from particular colonies, were unfortunately lost. If then the results of this part of the investigation were not as definite as could be wished, it is because for such an investigation one's whole time is required, and not merely what can be spared from other work.

Of the cultures from Calf 689 none grew in the manner characteristic of a virus of Group II. such as "S.C.," but occasionally a eugonic feature was noticed. These, however, were so much the less significant, seeing that "B.S." the dysgonic constituent of the mixture of cultures used, had been grown for long on artificial media, and had thereby acquired a considerable luxuriance of growth.

Among the cultures from the prescapular gland one on glycerin-serum showed a large eugonic colony heaped up and wrinkled, amidst a poor growth of small colonies. Another culture on the same medium grew many large raised cream-coloured colonies. This growth might have passed for one of "S.C." but was not typical of "S.C." at its best, while it was itself the best produced by this strain; moreover, subcultures from it did not grow like "S.C." Unfortunately, at this stage the strain was lost.

Of the cultures from the thoracic gland, two produced, on glycerin-serum, largish raised cream-coloured colonies like "S.C.," but not quite characteristic. A third subculture grew like "B.S.," not at all like "S.C.," and so also did glycerin-agar and broth cultures.

Of the cultures grown from the spleen, a third subculture on glycerin-serum was fairly characteristic of "S.C." Some of the earlier cultures, also on glycerin-serum, grew somewhat like "S.C." but not characteristically. A fourth culture, the second on glycerin-serum (from the ox) grew in large raised white colonies, a similar culture on glycerin-serum (from the dog) grew very definitely in large and small colonies. Glycerin-agar cultures, however, were not eugonic.

Of the cultures obtained indirectly from the lung through guinea-pigs, none have grown like "S.C.," but all might well be "B.S." without admixture. On agar one culture alone grew, and that only moderately. On the other hand, on broth added to the serum cultures vigorous growth took place.

The cultures from Calf 689 then on the whole were not like those of "S.C." nor yet like mixed cultures of "B.S." and "S.C." in anything like equal proportions. Yet now and then an occasional eugonic character had suggested there might be a trace of "S.C." in a culture which was composed almost entirely of "B.S." And indeed if "S.C." were present at all in the metastatic lesions of the calf, it was not reasonable to expect them to be present in anything more than very small numbers.

Accordingly steps were taken to grow the culture under conditions which would favour any trace of "S.C." that might be present, and cause it to become evident. For this purpose the various strains from the calf were grown for several generations on glycerin-serum. Since the dysgonic "B.S." improved itself in luxuriance of growth when grown on glycerin-serum, it was necessary to compare these strains with a series of cultures of "B.S." on the same medium.

On this medium the strains of bacilli from the calf improved in luxuriance of growth and approximated to cultures of "S.C." alone, nevertheless they were not so superior to the series of cultures of "B.S." alone on this medium that one could draw any safe conclusions from these cultural characters.

Calf 649, as stated above, was injected on March 15, 1905 with 50 mg. of "S.C." culture on one side of the neck and 50 mg. of "B.S." on the other. It was killed when dying, 41 days later, and was found to have general tuberculosis. Cultures were raised from the great thoracic gland, renal lymph gland, and spleen.

The culture from the great thoracic gland cannot be considered eugonic. Its growth on glycerin-serum was no better than that of "B.S." itself at this period, and it failed to grow on agar. It is true that it quickly learnt to grow well in a series of glycerin-serum culture, but without any marked superiority over a similar series of "B.S." cultures.

The cultures from the renal gland and the spleen were similar to those from the prescapular gland, with the important exception that on one of the agar tubes from the spleen two large pyramidal wrinkled colonies appeared, strains raised from which are now being followed up.

It has been stated above that large and small colonies were seen on a glycerin-serum tube sown with the strain derived from the spleen of Calf 689. Serum cultures sown from each variety of colonies were injected into rabbits. Both proved fully virulent.

VIRUS H. 8. "S.C." (Group II.)
VIRUS H. 10. "B.S." (Group I.)

CALF INJECTIONS. MARCH 15, 1905.

[H. 8. "S.C." Strain derived from human mesenteric glands direct.]
Subculture used, 21 days old.

[H. 10. "B.S." Strain derived from Calf 113, through G.-P. 757.]
Subculture used, 21 days old.

BULL-CALF 649.

Subcutaneous.

Dose: 50 mg. "S.C." on left side, 50 mg. "B.S." on right side, prescapular region.

Killed, when dying: April 25, 1905.

41 days.

P.M. — General tuberculosis, severe.

RABBIT [Intraperitoneal].

Dose: 5 mg. each of "S.C." and "B.S." mixed before injection.

Number.	Duration of Life.	Result.
299	Died, 16 days	Acute tuberculosis. ? any other cause of death.

BULL-CALF 689.

Subcutaneous.

Dose: 50 mg. "S.C.," 50 mg. "B.S.," mixed before injection.

Killed, when very ill: May 2, 1905.

48 days.

P.M. — General tuberculosis.

GUINEA-PIGS [Intraperitoneal].

	Number.	Duration of Life.	Result.
E. of prescapular gland of Calf 689.	531	Died, 30 days	G. T.
	532	" 24 "	G. T.
E. of thoracic gland	533	" 25 "	G. T.
	534	" 30 "	G. T.
E. of renal gland ...	535	" 18 "	G. T.
	536	" 28 "	G. T.
E. of lung	537	" 35 "	G. T.
	538	" 29 "	G. T.

BULL-CALF 757.

Subcutaneous.

Emulsion of lung.

Dose: 85,340,000 T.B.

Killed, when very ill: June 24, 1905.

53 days.

P.M. — General tuberculosis, moderately severe.

STRAIN OF CULTURE DERIVED FROM THE SPLEEN OF CALF 689.

Separation of Colonies on a Glycerin Medium.

Sub-cultures three weeks old. Rabbits inoculated intraperitoneally.

—	Total Duration of Artificial Cultivation.	Medium on which Final Culture was Grown.	Dose in Milli-grammes.	Number of Rabbit.	Killed or Died.	Duration of Life in Days.	Result.
Sub-strain of culture, 5 months old, raised from a *large colony* on a glycerin - serum medium.	12½ months	Pure serum	10·0	883	Died	89 days	General tuberculosis (injection partly intracœcal).
			1·0	884	Died	28 days	General tuberculosis.
			1·0	885	Died	28 days	General tuberculosis.
Sub-strain of culture, 5 months old, raised from a *small colony* on a glycerin - serum medium.	12½ months	Pure serum	1·0	881	Died	15 days	General tuberculosis, acute.
			1·0	882	Died	27 days	General tuberculosis.

On the whole then the cultural characters of the strains of tubercle bacilli raised from this calf, injected with mixed cultures, even that from the gland nearest to the seat of injection, were such as to afford no definite evidence of the presence of the bacilli of Group II. in the lesions produced in this animal by the bacilli of Group I. On the other hand, it cannot be affirmed that evidence of this was entirely absent, and some of the cultures developed colonies on glycerin-serum which suggested that a few bacilli of this kind were present. If strains from these colonies had been followed up, it is possible that the presence of bacilli of the virus belonging to Group II. might have been demonstrated.

Calf 757 was injected subcutaneously with an emulsion of the tuberculous lung of Calf 689, in order to see whether bacilli of Group II. as well as those of Group I. would be thereby communicated. It was probably a mistake to choose the lung rather than some other organ containing metastatic lesions, because tubercle bacilli have not infrequently been found in the lungs of calves even three months after subcutaneous injection of bacilli of Group II. But at the time this was not known.

This calf became very ill, and was killed 53 days after injection. It was found to have general tuberculosis. Cultures were sown from the local lesion, prescapular gland, long thoracic gland, lung and spleen. They were, on the whole, rather variable and difficult to interpret.

Those from the local lesion were very fairly eugonic on glycerin-serum, and became markedly so after growing for several generations on this medium. They grew but little, however, on glycerin-agar.

Those from the prescapular gland were moderately eugonic on glycerin-serum, but grew, like the above, but little on glycerin-agar. One of the cultures on glycerin-serum showed very distinctly two kinds of growth—a ground-glass layer studded with large raised white colonies.

The cultures from the spleen were at first only moderately eugonic on glycerin-serum, but became fairly so after several generations of growth on that medium.

They failed to grow on glycerin-agar.

The lung cultures were not eugonic on glycerin-serum, and they did not become so even after five generations of growth on that medium. They did not grow on glycerin-agar.

The cultures from the long thoracic gland were very fairly eugonic on glycerin-serum at the start, and became markedly so after growing for several generations on that medium. A glycerin-agar culture grew a single large wrinkled pyramidal colony, which afterwards became surrounded with daughter colonies; this particular culture, at least, was typically eugonic. Other glycerin-agar cultures grew less well or not at all.

Therefore, judging from the cultural characters of the strains of tubercle bacilli raised from the various metastatic lesions in this calf, it seems probable that the virus "S.C." (Group II.), reached some of the metastatic lesions caused by the virulent virus "B.S.", but not all (*e.g.*, the lungs). But the cultural characters were not sufficiently definite to amount to conclusive evidence. Accordingly, a strain showing fairly eugonic characters, namely, that from the long thoracic gland of the calf, was chosen and its virulence tested after it had been grown for five generations on glycerin-serum, in order to see whether the virulent element ("B.S.") could be eliminated, and the non-virulent ("S.C.") put in evidence, as had been done with some of the cultures raised from the rabbits injected with virulent viruses.

The final cultures were grown on pure serum and injected when three weeks old. The injections were intended to be intraperitoneal, but in two instances they were found to have been more or less intramuscular.

STRAIN OF CULTURE DERIVED FROM THE LONG THORACIC GLAND OF CALF 757.

Glycerin-Serum Series.

Sub-culture three weeks old. Rabbits inoculated intraperitoneally.

—	Total Duration of Artificial Cultivation.	Medium on which Final Culture was Grown.	Dose in Milli-grammes.	Number of Rabbit.	Killed or Died.	Duration of Life in Days.	Result.
Grown for 5 generations on glycerin-serum media.	6½ months	Pure serum	10·0	763	Died	23 days	General tuberculosis (injection partly intramuscular).
			1·0	764	Died	80 days	General tuberculosis (injection intramuscular).
			1·0	765	Died	42 days	General tuberculosis.
			1·0	766	Died	23 days	General tuberculosis.

All the rabbits died of general tuberculosis. The long duration of life in No. 764 was accounted for by the injection having been entirely intramuscular. These results proved the strain highly virulent for rabbits, and showed that the "S.C." bacilli had not been isolated. They therefore afford no evidence of their presence. And one must conclude either that bacilli belonging to the Group II. Virus "S.C." were not present in the metastatic lesions of the Calf 757. Or that, if they were, our methods had failed to demonstrate them.

Calf 649 was injected with 50 mg. of culture of the bacilli belonging to the virus "B.S." (Group I.) on one side of the neck and an equall quantity of culture of the bacilli belonging to "S.C." (Group II.) on the other. It became very ill, and when killed 41 days after injection was found to have general tuberculosis.

Cultures were raised from the great thoracic gland, renal lymphatic gland, and spleen. Those from the great thoracic gland grew no better on glycerin-serum than did control cultures of "B.S." only at this period, and they did not grow on glycerin-agar.

The cultures from the renal gland were like those from the long-thoracic; and so, in general, were those from the spleen; but on one of the glycerin-agar tubes two large pyramidal and wrinkled colonies arose. A substrain was raised from one of these and injected into rabbits, but it proved fully virulent, thus affording no evidence of the presence of bacilli belonging to the virus "S.C." in the lesions of this calf.

STRAIN OF CULTURE DERIVED FROM THE SPLEEN OF CALF 649.

"Separation of Colonies" on a Glycerin Medium.

Sub-culture three weeks old. Rabbits inoculated intraperitoneally.

—	Total Duration of Artificial Cultivation.	Medium on which Final Culture was Grown.	Dose in Milligrammes.	Number of Rabbit.	Killed or Died.	Duration of Life in Days.	Result.
Sub-strain of culture 1 month old, raised from a *large wrinkled colony* on a glycerin-agar medium.	13 months	Pure serum	10·0	900	Died	14 days	Early general tuberculosis.
			10·0	901	Died	19 days	General tuberculosis.
			1·0	902	Died	115 days	General tuberculosis (injection partly intracaecal).
			1·0	903	Died	28 days	General tuberculosis.

SUMMARY.

These experiments proved that in rabbits injected with mixed cultures of bacilli belonging to both our human groups, the bacilli which are slightly virulent for the species may be found in metastatic lesions. This is not surprising seeing how commonly bacilli of Group II. cause metastatic lesions in these animals, although the lesions are as a rule trivial and very seldom progress.

In calves injected with mixed cultures, no satisfactory evidence was obtained of the presence of bacilli belonging to Group II. in the metastatic lesions caused by injecting mixtures of bacilli of both groups. But on the other hand the absence of these slightly virulent bacilli from such lesions was not proved.

These experiments show that when mixtures of the human and bovine types of tubercle bacilli are passed through a series of animals which are very susceptible to the attack of the latter and only slightly so to that of the former type of bacilli, the former may become, but probably not necessarily, eliminated.

POST-MORTEM NOTES OF CALVES USED IN THE "MIXED VIRUS" EXPERIMENTS.

CALF 649.

Subcutaneous Inoculation of (1) 50 milligrammes of culture derived from Calf 113, H. 10. "B.S."; (2) 50 milligrammes of culture derived from human mesenteric glands, H. 8. "S.C."

The former was injected on the right side of the neck, the latter on the left.

Date—March 15, 1905.

Killed when dying—April 25, 1905. [41 days after inoculation.]

Weights.

	qrs.	lbs.
March 15, 1905	3	17
April 25, 1905	3	10

Total loss of weight.—7 lbs.

Rate of loss per week.—1·15 lbs.

POST-MORTEM EXAMINATION.

General Condition.—Thin.

Local Lesion.—At the seat of inoculation, on the right side of the neck ("B.S. inoculation"), was a flattened solid tumour, 4 in. by 3 in., which infiltrated skin and subjacent muscle, and was principally composed of dense caseo-necrotic tissue, which contained small irregular cavities with serous contents.

Right Prescapular Gland.—Was enlarged, 3¼ in. by 1½ in., and was caseo-necrotic throughout.

Right Prepectoral Gland.—Was as large as a cherry, and was similarly affected.

Local Lesion.—At the seat of inoculation, on the left side of the neck ("S.C. inoculation"), was a very small swelling 1½ in. by 1¼ in., composed of a caseous and partly softened mass, which did not infiltrate skin or subjacent muscle.

Left Prescapular Gland.—Was scarcely at all enlarged, and, like the great majority of other glands, contained a few caseous tubercles.

Left Prepectoral Gland.—Contained a single tubercle.

Prepectoral Glands, Right Deep Cervical Glands.—Contained a few tubercles, which were rather larger than usual, reaching a size of ⅛ in. to ⅙ in. and were distinctly caseating.

Thorax.

Pleura.—Was not affected.

Lungs.—Contained many small caseous tubercles, with translucent dark red margins. The anterior lobes were collapsed, and here the tubercles appeared whitish. Small areas of collapse occurred also in other parts of the lung. Section showed the tubercles to be scattered everywhere, and also revealed small rectilinear solid and partly caseous patches, evidently tuberculous lobes.

Thoracic Glands.—Were all much enlarged, and were caseo-necrotic throughout.

Heart.—Contained a single minute tubercle in the right auricle, and a tubercle (?) on one of the cordae.

Abdomen.

Intestines.—The small intestine contained small yellow solid caseous points, sparsely but widely scattered.

Mesenteric Glands.—Were almost all slightly affected, containing one or more shot-sized caseating tubercles.

Spleen.—Contained a moderate number of rather large (large shot sized) tubercles.

Liver.—The liver was spotted moderately thick with tubercles, which did not exceed ⅛ in. in diameter, and many similar tubercles were seen on section.

Hepatic Glands.—Were enlarged and were entirely composed of tuberculous tissue, grey and translucent, with caseous points and networks.

Kidneys.—Contained small tubercles and groups of minute tubercles in their cortices, several in each lobule.

Suprarenals.—Normal.

Renal Glands.—Were severly affected. They contained a few tubercles, which were rather larger than usual, reaching a size of ⅛ or ⅙ in., and were distinctly caseating.

Lumbar Glands, Iliac Glands.—Resembled the renal glands, but were not so severly affected.

Special Glands.

Precrural, Gluteal, Right Popliteal, Submaxillary, Parotideal, Post-Pharyngeal, Hyoid.—Contained a few tubercles, which were rather larger than usual, reaching a size of ⅛ or ⅙ in., and were distinctly caseating.

Tonsils.—One tonsil contained a tuberculous focus.

Microscopical Examination.

Emulsion of Spleen, Emulsion of Thoracic Gland, Emulsion of Right Renal Gland, Emulsion of Lung, Tubercle from Intestine.—Tubercle bacilli numerous in the smear preparations from all these sources.

CALF 689.

Subcutaneous Inoculation on the right side of the neck of 100 milligrammes of culture, consisting of 50 milligrammes each of culture of H. 8. "S.C.," and of H. 10. "B.S.," mixed before injection.

Date—March 15, 1905.

Killed, when very ill—May 2, 1905. [48 days after inoculation.]

Weights.

	qrs.	lbs.
Weight at inoculation	3	26
Weight at death	3	21

Total loss of weight.—5 lbs.

Rate of loss per week during experiment.—0·7 lb.

POST-MORTEM EXAMINATION.

General Condition.—Thin.

Local Lesion.—At the seat of inoculation, on the right side of the neck, was a flat tumour, 5 in. by 3 in., which infiltrated the skin and subjacent muscle. It was principally composed of tough salmon pink caseo-necrotic tissue, and contained an irregular cavity filled with serous fluid.

Right Prescapular Gland—Measured $3\frac{1}{4}$ in. by 2 in. Its cortex was almost entirely composed of dense salmon pink caseo-necrotic tissue.

Left Prescapular Gland.—Was slightly affected, and contained only a few small insignificant foci.

Right Prepectoral Gland.—The size of a cherry, and resembled the right prescapular in structure.

Pectoral Glands.—Right pectoral glands were enlarged and their cortices firm and somewhat gelatinous, with early caseating foci.

Axillary Glands.—Resembled the left prescapular.

Cervical Glands.—The deep cervical lymphatic glands were only slightly affected.

Thorax.

Pleura.—Normal.

Lungs.—The lungs were packed with rather large tubercles up to an eighth of an inch in diameter, with a pinkish grey irregular margin, and a relatively large caseous centre. A portion of the anterior lobes was dark red in colour and consolidated. Tubercles were uniformly and thickly scattered throughout the lung substance. The bronchi were full of mucus.

Trachea.—Normal.

Thoracic Glands.—Were enlarged and somewhat gelatinous. Their cortices were everywhere transformed into translucent grey tuberculous tissue, packed with early caseating foci.

Heart.—Normal.

Abdomen.

Peritoneum, Omentum.—Normal.

Intestines.—The intestines everywhere contained numerous whitish foci up to an eighth of an inch in diameter, which could be seen plainly from the peritoneal surface, and also from the mucous surface. These were definitely caseating. In some of the Peyer's patches the caseating foci were commencing to ulcerate.

In the cæcum the crowded solitary follicles were swollen and pink, and each had a central depression. Foci could be seen in the large intestine similar to those in the small intestine, but they were less numerous.

Mesenteric Glands.—Were swollen to about double their normal size, were firm and gelatinous, and their cortices were almost universally converted into translucent grey tissue, which contained a yellowish network and small caseating islands.

Spleen.—Contained only a moderate number of small tubercles.

Liver.—No tubercles could be seen in the liver.

Hepatic Glands.—Were similar to the thoracic.

Kidneys.—One small tubercle was seen in the right, two in the left. About the pelvis of the left kidney, and the left ureter, was a large amount of œdema.

Suprarenals.—A tubercle was found in one; the other was normal.

Renal Glands, Lumbar Glands.—Resembled the mesenteric glands, but were in a less advanced stage.

Iliac Glands.—Were slightly affected, and contained only a few small insignificant foci.

Ischiatic Glands.—Normal.

Genito-Urinary System.

Testes.—Normal.

Special Glands.

Precrural, Right Gluteal.—Were slightly affected, containing only a few small insignificant foci.

Left Gluteal.—Normal.

Popliteal.—Resembled the precrural and right gluteal.

Left Submaxillary.—Was only slightly affected.

Right Submaxillary, Parotideal, Pharyngeal.—Were rather more severly affected, with caseous foci.

Hyoid.—Were only slightly affected.

Tongue, Palate, Tonsils, Pharynx, Larynx.—Normal.

Microscopical Examination.

Emulsion of Lung, Emulsion of Spleen, Prescapular Gland, Thoracic Gland.—Tubercle bacilli numerous.

Renal Gland.—Tubercle bacilli.

Mucus from Bronchi.—Tubercle bacilli.

Tubercle from Small Intestine.—Tubercle bacilli numerous.

Tubercle from Cæcum.—A few tubercle bacilli.

Rib Marrow.—No tubercle bacilli.

CALF 757.

Subcutaneous Inoculation on right side of neck, of emulsion of lung of Calf 689, the first calf of the series.

Date of Inoculation—May 2, 1905.

Dose—85,340,000 tubercle bacilli.

Killed, when very ill—June 24, 1905. [53 days after inoculation.]

Weight.

	cwt.	qrs.	lbs.
May 2, 1905	1	0	7
June 24, 1905	0	3	14

Total loss of weight.—21 lbs.

Rate of loss per week.—2·7 lbs.

POST-MORTEM EXAMINATION.

General Condition.—Thin.

Local Lesion.—At the seat of inoculation, on the right side of the neck, was a tumour which measured $4\frac{1}{4}$ in. by 4 in. It was caseo-necrotic throughout, and infiltrated skin and subjacent muscle.

Right Prescapular Gland.—Was much enlarged. It measured 4 in. by $2\frac{1}{2}$ in. by $1\frac{3}{4}$ in., and weighed over 4 ozs. It was caseo-necrotic throughout.

Left Prescapular Gland.—Contained a small tubercle.

Right Prepectoral Gland.—The spherical prepectoral gland, an $\frac{1}{8}$ in. in diameter, was similar in structure to the right prescapular.

Axillary Glands.—Normal

Thorax.

Pleura.—Normal.

Lungs.—The anterior lobes on the left side were completely consolidated, those on the right were partly so. They were studded with prominent grey nodules of various sizes, some irregular evidently compound nodules being as much as a quarter of an inch in long diameter. The rest of the lung was studded with similar tubercles, each surrounded by a zone of dark reddish-grey colour, irregular in outline.

On section the lung was found to be composed of dark reddish-grey consolidated lobules, with rectilinear outlines, about ½ in. to 3 in. in diameter, though sometimes larger areas were produced by confluence of smaller ones. In the left lung about half the tissue was composed of these solid lobules, in the right considerably less. The solid portions had a grey deposit of tuberculous tissue arranged in a moss-like pattern. Both in the consolidated and the air-containing portions tubercles like those seen on the surface were somewhat sparsely scattered.

Trachea.—Normal.

Thoracic Glands. — Were much enlarged, and together weighed 9 ozs. The long thoracic gland weighed 4 ozs., and measured 5 in. by 1½ in. by 1¾ in. The others were enlarged in the same proportion. There was much œdema round the glands. They were composed of caseous striæ and networks in a grey translucent matrix.

Heart.—Normal.

Abdomen.

Peritoneum, Omentum.—Normal.

Intestines.—A few small tubercles were seen in the small intestine ; the large intestine was normal.

Mesenteric Glands.—Contained a small number of rather large tuberculous nodules up to the size of small peas, grey and translucent, with ramifying caseous centres.

Spleen.—Contained a moderate number of tubercles, about fifty being seen in a longitudinal section. Some of these were rather large, being about a ⅙ in. in diameter.

Liver.—On the surface of the liver was a small number of tubercles, a few being an eighth of an inch in diameter. One on the under surface attained the size of a quarter of an inch. Small tubercles were sparsely scattered throughout the liver substance.

Hepatic Glands.—Were enlarged, and similar to the thoracic, though not quite so advanced.

Kidneys.—A small number of tubercles (about twelve) were found in each kidney, fibrous, with opaque centres. The fat had disappeared from the pelves, which were very œdematous.

Suprarenals.—Normal.

Renal Glands, Lumbar Glands. — Were much enlarged and severely affected, their cortices being entirely composed of confluent nodules like those described in the mesenteric glands.

Iliac Glands.—Left contained a small tubercle. Right normal.

Ischiatic Glands.—Normal.

Genito-Urinary System.

Testes.—Normal.

Special Glands.

Precrural.—Left, contained large caseating nodules. Right, normal.

Pubic.—One contained a nodule.

Popliteal.—Normal.

Submaxillary.—Normal.

Parotideal.—The right contained a single tubercle. Left, normal.

Pharyngeal. — Contained several rather large tubercles.

Hyoid.—Contained large tuberculous nodules.

Tongue.—At the base of the tongue the circumvallate papillæ were enlarged and warty in appearance. They seemed to be slightly ulcerated.

Tonsils, Pharynx, Larynx.—Normal.

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PREFACE.

This volume records the results of five investigations carried out at Walpole Farm the titles of which are given on the opposite page.

Much of the preliminary work on two of the investigations, namely those on Equine and Avian Tubercle Bacilli, was carried out conjointly with Dr. A. Stanley Griffith. I am much indebted to Mr. C. F. Fox for his assistance in the preparation of the reports.

F. G.

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BY

F. GRIFFITH, M.B.

INVESTIGATION OF TUBERCLE BACILLI DERIVED FROM TUBERCULOSIS OCCURRING NATURALLY IN THE HORSE.

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INTRODUCTION.

Tuberculous material has been obtained from five cases of tuberculosis occurring naturally in the horse, and the characters and virulence of the cultures isolated from this material have been made the subjects of investigation.

The original material of virus E. III. came from a horse which had enormously enlarged tuberculous mesenteric glands ; that of viruses E. I. and E. V. was obtained from horses affected with general tuberculosis. Virus E. II. was derived from the spleen of a horse which had tuberculosis of the mesenteric glands, and virus E. IV. from the spleen of a horse in which no lesions were visible elsewhere.

The results of the investigation are presented in sequence thus. This introduction is followed by the general results of the experiments under two headings and by a short statement as to the characters of the cultures. On page 10 are the Tables of Origin of the Equine Viruses, which contain, together with other details, a description of the material from which the cultures were obtained. On page 12 are summarised the results of the inoculation experiments on animals with the cultures from the original material of each virus, and in addition the results of the animal passage experiments with virus E. II. and virus E. IV.

The rest of this Report, which contains the tabular summaries of inoculation experiments on different species of animals, the descriptive charts showing the inoculation experiments made with each virus, and the detailed accounts of the post-mortem examinations of the larger animals, is divided into two parts. In the first part are the details of the experiments with the cultures from the original material ; in the second part are the details of the passage experiments. At the end of the Report there are included control experiments with bovine tubercle bacilli on horses and monkeys.

GENERAL RESULTS.

(a) Experiments with Cultures from the Original Material.

Cultures from three viruses, E. I., E. III. and E. V., correspond exactly in their characters on artificial media and in their high virulence for rabbits and guinea-pigs with cultures isolated from bovine animals. Viruses E. I. and E. III. have in addition been tested by the subcutaneous inoculation of culture on calves and pigs and have caused in all these animals fatal general tuberculosis such as follows the inoculation of virulent tubercle bacilli of bovine origin.

The cultures from the remaining two viruses, E. II. and E. IV., grow on artificial media like bovine tubercle bacilli, alike when freshly isolated and after three years of residence on artificial media ; with this individual difference that the first has the characters of the most difficult growing bovine tubercle bacillus, and the second resembles an easy growing bovine bacillus.

The culture of virus E. II. was inoculated subcutaneously into seven calves all of which remained in good health and developed merely retrogressive tuberculosis, slight in extent and similar to that produced in calves by a tubercle bacillus of low virulence derived from man. For rabbits virus E. II. is moderately virulent, causing fatal general tuberculosis by the intravenous and intraperitoneal methods of inoculation, and setting up after subcutaneous inoculation tuberculosis varying in degree but never so severe as that produced by a bovine tubercle bacillus. The tuberculosis produced in monkeys by virus E. II. is definitely less severe than that following the inoculation of bovine tubercle bacilli. After subcutaneous inoculation this animal develops slowly progressive disease although fatal tuberculosis is invariably produced. After feeding, the disease in monkeys is still more chronic and in one case was only slightly generalised even after 101 days. In pigs and guinea-pigs fatal general tuberculosis has followed subcutaneous inoculations in every case but the fatal result in these animals has been usually somewhat retarded as compared with that resulting from the inoculation of bovine tubercle bacilli.

The culture from virus E. IV. was inoculated subcutaneously into six calves. Five of these remained in good health and showed when killed after about three months slight non-progressive tuberculosis. The sixth (No. 498) died of general tuberculosis of an irregular type, 89 days after inoculation ; it showed a severe tuberculous pneumonic condition of the lungs with very little disease elsewhere. This exceptional result may be due either to greater susceptibility of the particular animal or to accidental introduction of a portion of the culture into a vein at the time of inoculation ; of the two suppositions the latter appears the more probable. For rabbits the culture of virus E. IV. is moderately virulent and the different methods of inoculation have caused tuberculosis of varying degree the results being similar to those obtained with virus E. II. Two young baboons were tested, one by subcutaneous inoculation the other by feeding. The former, Baboon 72, succumbed to moderately severe general tuberculosis after a somewhat prolonged period, the latter, Baboon 74, remained well and when killed after 448 days showed only a slight non-progressive tuberculosis. For monkeys the virulence was lower than that of a bovine tubercle bacillus. In pigs and guinea-pigs fatal general tuberculosis was produced after periods usually longer than after the inoculation of bovine tubercle bacilli.*

The virulence of three of the equine viruses has been tested on horses. The culture of virus E. I. inoculated intravenously in a dose of 10 milligrammes caused fatal tuberculosis in 17 days. The horses inoculated intravenously with equivalent doses of viruses E. II. and E. IV. died of general tuberculosis in 40 and 98 days respectively. The culture of virus E. II. did not cause progressive tuberculosis after subcutaneous inoculation : a horse inoculated subcutaneously with virus E. IV. was killed when very ill after 125 days and had general tuberculosis.

The experiments on horses with bovine tubercle bacilli have not resulted in the production of progressive tuberculosis after either subcutaneous inoculation or feeding with moderately large doses, but by the intravenous inoculation of 10 milligrammes acute tuberculosis was set up fatal in 20 days (see page 137).

(b) Passage Experiments.

Since the cultures of viruses E. II. and E. IV. resembled bovine tubercle bacilli so closely in their cultural characters and in some respects in their pathogenic properties, it was considered possible that they might be cultures of bovine tubercle bacilli which had become attenuated in their virulence by residence in the horse or before gaining entry into the horse. An attempt was made to throw light on this latter question by inoculating horses with fully virulent bovine tubercle bacilli, subsequently recovering the bacilli by culture and testing the virulence of these cultures on rabbits and a calf. There was however no alteration in virulence or characters after in one case 124 days and in another 132 days residence in the body of the horse (see page 137).

A sufficient number of experiments has been performed for the determination of the virulence for calves of the cultures from the original material of viruses E. II. and E. IV. and out of 13 calves inoculated 12 have shown no more disease than may follow the subcutaneous inoculation of slightly virulent tubercle bacilli of human origin (see Table, page 17).

With the culture of virus E. II. four passage experiments on calves were performed (*see* pages 105–109). In the first experiment, beginning with Calf 404, one of the two final calves showed rather more generalised tuberculosis than had occurred with the original culture. In the second, beginning with Calf 406, there were two branches, in one of which the result was negative and in the other the full virulence of a bovine tubercle bacillus was attained. In each of the other two passage experiments the virulence was increased for calves and rabbits. Two monkeys were tested with passage cultures from Calves 506 and 404 of which one had increased in virulence for the calf and the other was unchanged ; the former culture showed increased virulence for the monkey and the latter produced no more disease in the monkey than that caused by the original culture.

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* A series of Charts illustrating diagrammatically these experiments will be found in Volume VII. of the Appendix.

A culture was recovered from a rabbit, No. 1330, which had died 265 days after subcutaneous inoculation with 1 milligramme of culture from the original material of Virus E. II., and was inoculated into a calf, in which it produced severe general tuberculosis.

With the culture of virus E. IV. three passage experiments were performed (*see* pages 123–126). The first, beginning with Calf 408, was entirely negative. The second, beginning with Calf 498 (the animal which developed severe lung tuberculosis), was also negative. In the third passage experiment there was an increase in virulence up to that of a fully virulent bovine tubercle bacillus. The culture derived from the lung of the first calf in this third passage, No. 502, was fully virulent, but the culture from the suprarenal body was not so virulent and produced in a calf only a chronic tuberculosis after 90 days. With the culture isolated from the mediastinal gland of this latter calf fatal general tuberculosis was set up in another calf in 39 days. In these experiments with virus E. IV. as with virus E. II. there was increased virulence for a monkey in a culture which had increased in virulence for the calf, while a culture that was unchanged in virulence for the calf showed no increase in virulence for a monkey.

A culture, recovered from a baboon, No. 74, which had been fed with culture of E. IV. and had been killed after 448 days, was tested in calves and rabbits; there was no increase in virulence or change in characters (*see* page 75). From Baboon 72, which died of general tuberculosis 144 days after subcutaneous inoculation of the same virus, cultures, derived both directly and through a guinea-pig, were definitely increased in virulence for rabbits.

CULTURAL CHARACTERS.

The cultures of viruses E. I., II., III., IV., and V., do not differ in their cultural characters from cultures of bovine origin; they show merely slight variations such as have been demonstrated among different strains of bovine tubercle bacilli, which fall according to their cultural characters into three classes.

Viruses E. II. and E. III. grow with the most difficulty and correspond with bovine cultures of Class I. Virus E. I. belongs to Class II. and viruses E. IV. and E. V. grow the most readily and fall into Class III.

Cultures have been isolated from a number of experimental animals including those in the various passage experiments, but no definite alteration in their manner of growth could be detected. Cultures were recovered and were found to be unchanged from the following animals:—Calves 404, 406, 408, 502, 504, 506, 582, 584, 588, 596, 598, 616, 620, and 638, Baboons 72 and 74, Monkeys 182, 186, and 202, Pony 22, and Rabbits 1320 and 1330.

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TABLE OF ORIGINS OF EQUINE VIRUSES.

Designation of Virus.	Source.	Date of Receipt of Virus.	Description of Animals and Lesions.	Tissue used for Experiment.	Animals Inoculated.	Classification of Virus according to Cultural Characters and Virulence.
E. I.	Royal Veterinary College.	December 19, 1905	The material received was a guinea-pig which had been inoculated subcutaneously from the liver of another guinea-pig inoculated from the tuberculous mesenteric lesions of a horse. The horse, examined by Sir John McFadyean, showed extensive tuberculous lesions in the mesenteric glands and spleen, and miliary tuberculosis of the lungs. The guinea-pig was killed 29 days after inoculation and had general tuberculosis.	Portal Gland of guinea-pig.	Calves, Rabbits, 1 Pig, Guinea-pigs, Fowls.	Bovine.
E. II.	Royal Veterinary College.	December 19, 1905	A guinea-pig, inoculated intraperitoneally from the tuberculous mesenteric glands of a horse, was sent by Sir John McFadyean. The spleen of the horse, as well as the mesenteric glands, was tuberculous. The guinea-pig was killed 13 days after inoculation and showed thickening and early caseation of the omentum, fairly numerous grey tubercles in the spleen, a few yellow foci in the liver, and caseation of the portal, sternal and lumbar (slight) glands; the pleural cavities were filled with blood-stained fluid and the lungs were collapsed.	Portal Gland of guinea-pig.	Calves, Rabbits, Guinea-pigs, 2 Lemurs, Monkeys, 2 Pigs, Rats and Fowls.	Corresponds to a bovine bacillus in cultural characters. Virulence irregular.
E. III.	Royal Veterinary College.	December 19, 1905	Enormously enlarged mesenteric glands from a horse were sent to Sir John McFadyean who inoculated from them a guinea-pig intraperitoneally. The guinea-pig was sent to the farm, where it was killed 40 days after inoculation. The post-mortem examination of the guinea-pig showed general tuberculosis of a mild type; the tubercles in the spleen, liver and lungs were grey, and there was very little caseation in the affected lymphatic glands.	Spleen of guinea-pig.	Calves, Rabbits, Guinea-pigs, Fowls, 1 Pig and 1 Lemur.	Bovine.
E. IV.	Royal Veterinary College.	December 19, 1905	The material received was a guinea-pig inoculated from the spleen of a horse. The horse was examined by Sir John McFadyean, and the only lesions visible were in the spleen; no tubercle bacilli were found. The guinea-pig was killed 29 days after inoculation; there were 3 or 4 translucent tubercles in the omentum; two miliary tubercles in the spleen, one grey, the other yellowish, and a minute opaque point in one lumbar gland; all other organs and glands were normal; tubercle bacilli were found in the grey tubercle from the spleen.	Spleen of guinea-pig.	Calves, Pigs, Rabbits, Guinea-pigs, 2 Baboons, Monkeys, Fowls and Rats.	Corresponds to a bovine bacillus in cultural characters. Virulence irregular.

E. V.	—	May 16, 1907	The specimens received were the mesenteric gland and pieces of lung and spleen of a horse which had died from general tuberculosis. The lung was closely infiltrated with irregular tuberculous masses, the majority of which were composed of dense fibroid tissue, homogeneous throughout or caseous in the centre ; a few were caseo-purulent with fibroid capsules. The lung parenchyma remaining was bright red and crepitant without inflammatory reaction. The piece of spleen contained two rounded tumours, the larger measuring 5 by 4 by 3·8 cm. On section they were composed of dense translucent tissue containing firm, yellow fibro-caseous patches. The mesenteric gland measured 6 by 5·3 cm. and in structure resembled the masses in the spleen. The lesions showed on microscopical examination of smear preparations numerous tubercle bacilli.	Lung, Spleen, and Mesenteric Gland.	Rabbits and Guinea-pigs.	Bovine.

SUMMARY OF RESULTS OF INOCULATION EXPERIMENTS WITH EACH VIRUS.

VIRUS E. I.

Calves, Pig, and Pony.

Three calves have been inoculated subcutaneously each with 50 milligrammes of culture of virus E. I. One, No. 436, inoculated when the culture had been in cultivation a total period of 188 days, died prematurely in 16 days of diarrhœa ; at the post-mortem examination there was local tuberculosis with early generalised tuberculosis. The other two calves, 522 and 528, inoculated with culture of a total age of 482 days, died of general tuberculosis in 30 and 36 days respectively.

Pig 192 was inoculated subcutaneously with 10 milligrammes of culture and died in 48 days of general tuberculosis.

Pony 16 inoculated intravenously with 10 milligrammes of culture died in 17 days of acute tuberculosis, the lungs alone showing macroscopic evidence of disease ; there was no great multiplication of tubercle bacilli in the organs and death was evidently due to a toxaemia rather than to a true tuberculosis.

Rabbits and Guinea-pigs.

Cultures varying in total age since isolation from 188 days to 782 days were inoculated intravenously, intraperitoneally or subcutaneously into 15 rabbits, all of which succumbed to general tuberculosis of the type and severity of that following the inoculation of bovine tubercle bacilli. Guinea-pigs developed general tuberculosis both after intraperitoneal and subcutaneous inoculations.

VIRUS E. III.

Calves, Pig, and Lemur.

Two calves, Nos. 440 and 508, were inoculated subcutaneously each with 50 milligrammes of culture and both died of general tuberculosis in 72 and 73 days respectively. Pig 194 died of general tuberculosis in 63 days after a subcutaneous inoculation of 10 milligrammes and Lemur 14 in 28 days after a subcutaneous inoculation of 1·0 milligramme.

Rabbits and Guinea-Pigs.

Cultures of virus E. III., of a total age of 218 and 410 days respectively, were inoculated into 10 rabbits, the intravenous, intraperitoneal and subcutaneous methods being used. All died of general tuberculosis, but the results in two or three cases after subcutaneous inoculations were not quite so severe as after the similar inoculation of bovine tubercle bacilli. Guinea-pigs died of general tuberculosis after both intraperitoneal and subcutaneous inoculations.

VIRUS E. V.

The original material obtained from the horse consisted of lung, spleen and a mesenteric gland, from each of which emulsions were made and inoculated into rabbits and guinea-pigs. All the animals developed severe general tuberculosis of the type following the inoculation of bovine tubercle bacilli.

Cultures were isolated direct from the original material (lung) and were inoculated into five rabbits and two guinea-pigs, all of which died of general tuberculosis.

VIRUS E. II.

A.—CULTURES FROM THE ORIGINAL MATERIAL.

Calves.

Two calves have been inoculated each with 10 milligrammes of culture, one with 20 milligrammes, three each with 50 milligrammes and one with 100 milligrammes. They were all killed when well after periods varying from 80 to 100 days and all showed slight retrogressive tuberculosis. At the seat of inoculation there was formed a fibrous walled cyst filled with soft caseous substance. The prescapular gland on the side of the local lesion was slightly enlarged and either was partly replaced by caseating substance or contained soft caseous nodules. The disseminated tuberculosis consisted of a few caseous tubercles and gritty foci in various lymphatic glands, a few foci or tubercles in the lungs and occasionally a tubercle in the liver and intestinal mucous membrane.

Rhesus Monkeys and Lemurs.

Five rhesus monkeys were inoculated subcutaneously, one, No. 168, with 10 milligrammes, three, Nos. 166, 180 and 216, each with 1·0 milligramme, and one, No. 184, with 0·1 milligramme. Monkey 168 died prematurely in 51 days and showed early general tuberculosis : monkey 166 dead after 19 days showed local tuberculosis only. The remaining three died of general tuberculosis in 66, 98 and 101 days.

Three monkeys were fed with culture. Monkey 186 received a dose of 1·0 milligramme from a pipette and died in 139 days of tuberculosis, most severe in the lungs (probably part of the dose was inhaled). Monkey 202 was fed naturally with 60 milligrammes in sterile milk, receiving 10 milligrammes per day for six days, and when killed after 101 days was well and in good condition ; the post-mortem examination showed very slight generalised tuberculosis. Monkey 208 received 50 milligrammes of culture in sterile milk and died in 115 days of general tuberculosis of moderate severity, most severe in the intestines and mesenteric glands.

Lemurs 16 and 18, inoculated and fed respectively, each with 1·0 milligramme of culture, died of general tuberculosis after 35 and 76 days respectively.

Pigs.

Two pigs were inoculated subcutaneously, No. 184 with 10 milligrammes and No. 186 with 50 milligrammes. Pig 186 was killed when ill after 174 days and Pig 184 when well after 268 days : both showed general tuberculosis severe in the lungs.

Ponies.

Pony 18 was inoculated intravenously with 10 milligrammes of culture and died of general tuberculosis in 40 days.

Pony 20 was inoculated subcutaneously with 50 milligrammes and was killed when well 130 days later. It showed a small local lesion and caseation of the adjacent prescapular glands, a nodule in the spleen, a few in the lungs, and no disease elsewhere.

Rabbits.

Thirteen rabbits were inoculated intravenously, six with 1·0 milligramme, six with 0·1 milligramme, and one with 0·01 milligramme. All died of general tuberculosis, those inoculated with 1·0 milligramme in from 20 to 57 days, those with 0·1 milligramme in from 22 to 127 days, and that with 0·01 milligramme in 36 days. The rabbit, No. 1331, which died after 127 days, had only moderately severe tuberculosis of a chronic type ; in the rest the disease was severe and extensive.

Three rabbits were inoculated intraperitoneally. Two, each receiving 1·0 milligramme, died in 29 and 88 days respectively, and one, after 0·1 milligramme, in 43 days, all with general tuberculosis.

Fourteen rabbits were inoculated subcutaneously with doses ranging from 0·1 milligramme up to 50 milligrammes, of which eight were killed in from 102 to 178 days and five died in from 37 to 110 days. In the remaining one, rabbit 1330, the inoculation was partly intraperitoneal and death occurred after 265 days of chronic general tuberculosis, severe in the lungs. In these rabbits the tuberculosis varied very considerably, but in none was the disease of the severity of that produced by bovine tubercle bacilli and in a few cases it was as slight as after a similar inoculation of slightly virulent human tubercle bacilli (Group II).

The following is a summary of the lesions found. At the seat of inoculation, usually in the subcutaneous tissue of the back, there was formed a caseous tumour which almost invariably softened and became cystic. The adjacent lymphatic glands contained curdy caseous nodules easily shelling out and leaving cavities in the apparently normal gland tissue that remained. In the lungs there was in several cases a single nodule or a small number of minute translucent tubercles, in others moderately numerous caseating tubercles and caseating nodules in the margins of the lobes. The kidneys, after large doses, were pitted on the surfaces and showed a few translucent tubercles in the cortices and caseous streaks in the pyramids. The kidneys of one animal, Rabbit 1468, the most severely infected, were studded with projecting caseating nodules up to a pea in size, such as are often found after the inoculation of bovine tubercle bacilli.

Guinea-pigs.

One guinea-pig, inoculated intraperitoneally with 0·1 milligramme, died in 40 days of general tuberculosis. Five guinea-pigs inoculated subcutaneously, three with 0·1 milligramme and two with 1·0 milligramme, died in from 44 to 212 days of general tuberculosis. The tuberculosis in several instances was of a very chronic type.

B.—CULTURES OF VIRUS E. II. AFTER PASSAGE.

PASSAGE α.

This passage experiment (*see* Table, page 105) began with the culture from the prescapular gland of Calf 404 (which had been inoculated with the culture from the original material). It was inoculated into the calves Nos. 590 and 598, of which the former died in seven days of broncho-pneumonia and diarrhœa, and the latter was killed after 91 days when it showed only slight disease. A culture was obtained from the spleen of Calf 590 and inoculated into Calf 618, which, when killed after 84 days, showed slight disease only. A culture was isolated from the prescapular gland of Calf 598 and was inoculated into Calf 640, which developed slight general tuberculosis. There was perhaps a slight increase of virulence shown for Calf 640, though it cannot be considered as definite. The rabbits inoculated with the culture from Calf 618, the final calf of the other branch of the passage, were more severely affected than any of the other series of rabbits and judging from those results it might certainly be expected that the culture would have been more virulent for calves (the virulence of the culture for calves was however not tested). The tests on rabbits of the cultures from Calves 404, 590, and 598 showed no great increase over what had occurred with the original material culture. A rhesus monkey, No. 212, was fed with the culture from Calf 404, and showed after 82 days very slight tuberculosis.

PASSAGE β.

This passage (*see* Table, page 106) began with the culture from the prescapular gland of Calf 406 (which was inoculated at the same time and from the same culture as Calf 404). It was inoculated into two calves, 596 and 600, and into a series of rabbits; the rabbits showed that the culture had the virulence of that of the original material. Calf 596 developed chronic general tuberculosis not at all severe, and Calf 600 had very slight tuberculosis. The culture from the lung of Calf 596 was inoculated into Calf 638 and rabbits; the calf died of general tuberculosis in 40 days and the rabbits all developed the severe tuberculosis characteristic of the action of the bovine tubercle bacillus. The culture from the prescapular gland of Calf 600 was inoculated into Calf 648 and into a series of rabbits; the results showed that the culture was like that of the original material. Here then had occurred a very marked increase of virulence for calves and rabbits in one branch of the passage and not in the other.

PASSAGE γ.

This passage (*see* Table, page 107) began with Calf 504, which had been inoculated with the culture from the original material after it had been in cultivation a total period of 405 days. The animal developed only slight disease after 100 days. A culture isolated from the prescapular gland caused general tuberculosis in a calf, fatal in 54 days, and was fully virulent for rabbits. A culture from the lung was fully virulent for rabbits, and caused fatal general tuberculosis in one calf in 29 days, while the fellow calf had generalised tuberculosis not severe and apparently retrogressive. In this experiment there was a definite increase in virulence almost up to the highest bovine virulence after residence in a single calf for 100 days.

PASSAGE δ.

Calf 506, inoculated at the same time as Calf 504, was at the beginning of this passage experiment (*see* Table, page 108). This animal developed slight tuberculosis after 99 days. A culture derived from the lung was found to be increased in virulence for rabbits, and at a later period it was inoculated into another series of rabbits and into a calf (No. 594), which however died prematurely and showed early tuberculosis. The culture was again tested in a calf and also in rabbits and a monkey. The rabbits and the monkey (No. 206) died of general tuberculosis but the calf (No. 628) lived for 90 days and when killed had only slight general tuberculosis. The culture from the lung of this latter calf was inoculated into another calf (No. 646), which died of general tuberculosis in 33 days, and into a series of rabbits all of which developed general tuberculosis. In this case there was a very definite increase in virulence after residence in the first calf for 99 days as shown by the effects on the rabbits and the monkey; there was required however another calf passage before the full bovine virulence was acquired.

PASSAGE ε.

A rabbit, No. 1330, was inoculated partly subcutaneously, partly intraperitoneally and died of chronic generalised tuberculosis after 265 days. A culture was derived from a caseating growth on the diaphragm and was found to be increased in virulence for the calf (Calf 632) and for rabbits (*see* Table, page 109).

VIRUS E. IV.

A.—CULTURES FROM THE ORIGINAL MATERIAL.

Calves.

Six calves were inoculated subcutaneously, two with 10 milligrammes of culture and four with 50 milligrammes respectively. Five were killed when well after periods ranging from 88 to 100 days. One calf, No. 498, died 89 days after inoculation.

The five which were killed showed only slight non-progressive tuberculosis. At the seat of the inoculation there was found a non-infiltrating caseous tumour which softened in most cases becoming cystic; the ajacent lymphatic glands were either partly caseous and softened or contained soft caseous nodules. In one case there was no disseminated disease and in another there were tubercles in the mesenteric glands; in two out of the other three there were tubercles in the suprarenal bodies and tubercles in the lungs and various mesenteric glands. The result in the case of Calf 498 was very irregular; the animal died from a severe tuberculous pneumonic condition of the lungs; there was also local tuberculosis but elsewhere the disease was extremely slight.

Baboons and Monkeys.

Baboon 72 was inoculated subcutaneously and Baboon 74 was fed, each with 1·0 milligramme of culture. The inoculated animal, No. 72, died of general tuberculosis in 144 days. Baboon 74 was killed after 448 days; it was in excellent condition and appeared perfectly well. The post-mortem examination revealed very slight, apparently non-progressive tuberculosis; there were a few caseo-purulent nodules in the mesenteric glands and in one deep cervical gland; the lungs.

liver, and kidneys showed a very few small tubercles. A culture was isolated from the mesenteric glands in which there was no change in cultural characters and no increase in virulence for calves.

Four rhesus monkeys were inoculated subcutaneously. Two, which received 1·0 and 10·0 milligrammes, died in 24 and 7 days respectively and showed local tuberculosis only. A third (No. 218, receiving 1·0 milligramme) was killed after 95 days and showed general tuberculosis, severe in the spleen, the fourth (No. 178, receiving 1·0 milligramme) died in 89 days of general tuberculosis. Two monkeys, Nos. 182 and 210, were fed. Monkey 182 received 1·0 milligramme of culture administered by a pipette and was killed in poor health 392 days later. It showed only slight general tuberculosis; there was a purulent nodule in the subcutaneous tissue of the neck, where during life an abscess had developed. Monkey 210 was killed when dying after 77 days; the only disseminated disease was a single tubercle in the lung. Death was due to severe tuberculosis of the intestine and mesenteric glands.

Pigs.

Two pigs, 188 and 190, were inoculated subcutaneously, the former with 10 the latter with 50 milligrammes of culture. Pig 188 was killed after 268 days when apparently well and had general tuberculosis. Pig 190 was killed after 175 days and had general tuberculosis, not severe.

Rabbits.

Twelve rabbits were inoculated intravenously, six with 1·0 milligramme and five with 0·1 milligramme and one with 0·01 milligramme. Those inoculated with 1·0 milligramme died in from 14 to 32 days and those with 0·1 milligramme in from 18 to 79 days and the one with 0·01 milligramme in 53 days, all of general tuberculosis.

Three rabbits were inoculated intraperitoneally. One received 0·1 milligramme and died in 47 days; the other two received 1·0 milligramme each, one dying in 28 days, and the other in 96 days of general tuberculosis (in the latter the inoculation was partly intra-caecal).

Sixteen rabbits were inoculated subcutaneously with doses of culture varying from 0·1 to 50 milligrammes. Eleven of them died, the majority from causes other than tuberculosis, and five were killed after periods varying from 100 to 265 days.

The extent, to which the animals inoculated subcutaneously were diseased, depended apparently upon the individual susceptibility rather than upon the dose. In none was the disease as extensive as that caused by the bovine tubercle bacillus. In general, there was formed at the seat of inoculation in the subcutaneous tissue, usually of the back, a caseous tumour, which became softened, cystic and occasionally ulcerated. The adjacent lymphatic glands contained softened caseous nodules easily shelling out of the gland substance. The lungs contained caseous tubercles and nodules varying from a few up to a moderate number. The kidneys showed a varying amount of disease; at the most there was a moderate number of soft caseous tubercles and depressed patches in the cortices, with caseous streaks in the pyramids. The mediastinal and portal glands occasionally contained caseous foci or tubercles; the spleen and liver were rarely affected. The rabbit inoculated with the largest dose—50 milligrammes—gained weight and appeared well when killed; the post-mortem examination showed only slight retrogressive tuberculosis.

In order to test upon what depended the great variation in amount of disease produced in rabbits by this virus, a series of 16 was inoculated subcutaneously with culture derived from single colonies. These single colonies were obtained from the sternal gland of a guinea-pig inoculated with culture from the original material, as it was considered more probable that the bacilli would be single in emulsions than in cultures and that a single colony might be derived from a single bacillus. Each rabbit received the culture from a serum-tube (about 10 milligrammes), and two rabbits were used for each colony. The results showed the same variation in extent of disease as has been described above (*see* Table, page 34).

Guinea-pigs.

One guinea-pig was inoculated intraperitoneally with 0·1 milligramme of culture, and died of general tuberculosis in 30 days. Six guinea-pigs were inoculated each with 1·0 milligramme, and died of acute tuberculosis in from 6 to 14 days. Five guinea-pigs were inoculated subcutaneously; two received 1·0 milligramme each, and died of general tuberculosis in 97 to 144 days respectively; three received 0·1 milligramme each, and died of general tuberculosis in 62, 167, and 60 days respectively. One guinea-pig, inoculated cutaneously, died in 88 days of general tuberculosis.

B.—CULTURES FROM VIRUS E. IV. AFTER PASSAGE.

PASSAGE α.

Calf 408, inoculated with culture from the original material, developed local tuberculosis only after 109 days, and a culture was isolated from the prescapular gland (*see* Table, page 123). This was inoculated into two calves, 582 and 584, three series of rabbits, and a monkey, No. 220. One calf, 582, had a little more generalised tuberculosis than had occurred after inoculation with culture from the original material; but the results in the other animals showed that the virulence had not materially altered. From each of the latter two calves, another calf was inoculated; in one case the culture was derived from the spleen, in the other from the suprarenal body. Both calves 636 and 642 had only slight disease after over 90 days, but the rabbits inoculated with the culture from Calf 582 had more extensive disease than that usually caused by the original culture. The result, however, as regards increase in virulence for the calf, was negative.

PASSAGE β.

Calf 498, inoculated with the culture from the original material, developed severe tuberculosis of the lungs (*see* Table, page 125). From the lungs a culture was isolated with which were inoculated two calves, Nos. 586 and 588, and a series of rabbits. The results showed no increase of virulence. From each calf a culture was recovered and inoculated into a calf and a series of rabbits. These two calves, Nos. 634 and 644, developed only slight disease. In this case also no increase in virulence could be recorded.

PASSAGE γ.

Calf 502 was inoculated at the same time as Calf 498, but the tuberculosis was only slight in degree; and whereas no increase in virulence occurred with the culture derived from Calf 498, the culture from Calf 502 became as fully virulent as a bovine tubercle bacillus. The following are the details (*see* Table, page 126): From the lung of Calf 502 a culture was gained which caused fatal general tuberculosis in two calves, Nos. 614 and 630, in a monkey, and in three series of rabbits. A culture was also obtained from the suprarenal body, and it was much less virulent than the culture from the lung. It caused in Calf 602 tuberculosis generalised, but not severe, and was not fully virulent for rabbits. From the mediastinal gland of Calf 602 a series of rabbits was inoculated, and a culture was isolated. The rabbits inoculated with emulsion developed general tuberculosis, and the culture produced in Calf 650 and a series of rabbits fatal general tuberculosis of great severity.

PART I.

EXPERIMENTS WITH CULTURES FROM THE ORIGINAL MATERIAL.

(i). Tabular summaries of Inoculation Experiments with the cultures from the original material of Viruses E. I., E. II., E. III., E. IV., and E. V.

(ii). Descriptive Chart of the Experiments with each Virus and Full Post-Mortem Notes on the larger experimental animals.

TABULAR SUMMARY OF INOCULATION EXPERIMENTS ON CALVES WITH CULTURES OF EQUINE TUBERCLE BACILLI.

All Subcutaneous.

Virus.	Source of Culture.	Total Age of Culture: Age and Generation of Sub-culture Inoculated.	Dose.	Date of Inoculation.	Number of Calf.	Weight in Kilos.		Duration of Life.	Result.
						Initial.	Final.		
E. I.	Original material	188 days 21 days old, 9th generation	50·0 mg.	June 27, 1906	436	29·02	29·47	Died 16 days	Early general tuberculosis. Death was caused by diarrhoea.
,,	,,	482 days 21 days old, 18th generation	50·0 mg.	April 17, 1907	522	42·62	38·54	Died 36 days	General tuberculosis.
,,	,,	,, ,,	50·0 mg.	,,	528	39·45	36·73	Died 30 days	General tuberculosis.
E. II.	Original material	130 days 21 days old, 7th generation	10·0 mg.	April 30, 1906	404	37·64	45·80	Killed 89 days	Local tuberculosis. A nodule in the liver and foci in thoracic and one renal lymphatic glands.
,,	,,	,, ,,	10·0 mg.	,,	406	33·55	44·44	Killed 91 days	Local tuberculosis. A few caseating nodules in the lungs and tubercles in various lymphatic glands.
,,	,,	405 days 21 days old, 19th generation	50·0 mg.	Jan. 30, 1907	504	60·76	92·06	Killed 100 days	Local tuberculosis. A tubercle in a kidney, a few in the lungs and in various lymphatic glands.
,,	,,	,, ,,	50·0 mg.	,,	506	82·08	102·94	Killed 99 days	Local tuberculosis. A few tubercles in the lungs and a few foci in a bronchial and a portal gland.
,,	,,	841 days 20 days old, 14th generation	100·0 mg.	April 10, 1908	608	39·90	43·35	Killed 80 days	Local tuberculosis. A caseous tubercle in a suprarenal body and a yellowish nodule in the intestinal mucous membrane.
,,	,,	,, ,,	50·0 mg.	,,	606	45·80	71·19	Killed 89 days	Local tuberculosis. A tubercle in the lung and one in the liver and a few in the mediastinal glands.
,,		,, ,,	20·0 mg.	,,	610	42·17	78·80	Killed 91 days	Local tuberculosis only.
E. III.	Original material	188 days 21 days old, 9th generation	50·0 mg.	June 27, 1906	440	39·45	36·25	Died 72 days	General tuberculosis.
,,	,,	410 days 21 days old, 18th generation	50·0 mg.	Feb. 4, 1907	508	69·38	64·39	Killed (dying) 73 days	General tuberculosis.
E. IV.	Original material	115 days 21 days old, 7th generation	10·0 mg.	April 30, 1906	408	46·25	66·66	Killed 109 days	Local tuberculosis only.
,,	,,	,, ,,	10·0 mg.	,,	410	35·82	55·32	Killed 88 days	Local tuberculosis. One tubercle in the liver and six in the thoracic glands.
,,	,,	390 days 21 days old, 18th generation	50·0 mg.	Jan. 30, 1907	498	34·91	31·75	Died 89 days	Severe pneumonic tuberculosis of the lungs. Slight tuberculosis of suprarenal bodies, thoracic and abdominal glands and intestines. One tubercle in the heart and one in the spleen.
,,	,,	,, ,,	50·0 mg.	,,	502	54·41	69·38	Killed 90 days	Local tuberculosis. Eight tubercles in the lungs, numerous in the suprarenal bodies, scattered tubercles in the thoracic and abdominal lymphatic glands.
,,	,,	795 days 22 days old, 13th generation	50·0 mg.	Mar. 11, 1908	616	48·97	60·76	Killed 100 days	Local tuberculosis and a few foci in the mesenteric glands.
,,	,,	,,	50·0 mg.	,,	620	82·08	89·33	Killed 91 days	Local tuberculosis. A few nodules on omentum, two in a suprarenal body, and a few in various lymphatic glands and in the intestines.

TABULAR SUMMARY FO INOCULATION AND FEEDING EXPERIMENTS ON RHESUS MONKEYS, BABOONS AND LEMURS WITH CULTURES OF EQUINE TUBERCLE BACILLI.

Virus.	Source of Culture.	Total Age of Culture: Age and Generation of Sub-culture Inoculated.	Dose.	Date of Inoculation.	Number of Animal.	Method of Inoculation	Duration of Life.	Result.
E. II.	Original material	510 days 21 days old, 25th generation	1·0 mg.	May 15, 1907	Monkey 166	Subcutaneous	Died 19 days	Local tuberculosis only. Cause of death not obvious.
,,	,,	,, ,,	10·0 mg.	,,	Monkey 168	..	Killed (very ill) 51 days	Early general tuberculosis. Death premature.
,,	,,	635 days 22 days old, 7th generation	1·0 mg.	Sept. 17, 1907	Monkey 180	..	Died 101 days	General tuberculosis. Not severe.
,,	,,	,, ,,	0·1 mg.	,,	Monkey 184	..	Died 98 days	General tuberculosis. Severe.
,,	,,	,, ,,	1·0 mg.	,,	Monkey 186	Fed	Died 139 days	Slight general tuberculosis. The culture appeared to have been inhaled.
,,	,,	788 days 21 days old, 31st generation	60·0 mg. (10·0 mg. per day)	Feb. 17, 1908	Monkey 202	,,	Killed 101 days	Tuberculosis of intestines and mesenteric glands, and very slight generalised tuberculosis.
,,	,,	841 days 20 days old, 14th generation	50·0 mg.	April 10, 1908	Monkey 208	Fed	Died 115 days	Severe tuberculosis of the mesenteric glands and general tuberculosis of moderate severity.
,,	,,	945 days 23 days old. 17th generation	1·0 mg.	July 23, 1908	Monkey 216	Subcutaneous	Died 66 days	General tuberculosis.
,,	,,	335 days 21 days old, 16th generation	1·0 mg.	Nov. 21, 1906	Lemur 16	Subcutaneous	Died 35 days	General tuberculosis.
,,	,,	,, ,,	1·0 mg.	,,	Lemur 18	Fed	Died 76 days	General tuberculosis
E. III.	Original material	338 days 22 days old, 14th generation	1·0 mg.	Nov. 24, 1906	Lemur 14	Subcutaneous	Killed (dying) 28 days	General tuberculosis.
E. IV.	Original material	495 days 20 days old, 23rd generation	1·0 mg.	May 15, 1907	Monkey 170	..	Died 24 days	Local tuberculosis only. Death from other causes.
,,	,,	,, ,,	10·0 mg.	,,	Monkey 172	..	Died 7 days	Local tuberculosis only. Death from other causes.
,,	,,	620 days 22 days old, 8th generation	1·0 mg.	Sept. 17, 1907	Monkey 178	,,	Died 89 days	General tuberculosis.
,,	,,	,, ,,	1·0 mg.	,,	Monkey 182	Fed	Killed 392 days	Slight general tuberculosis.
,,	,,	825 days 20 days old, 15th generation	50·0 mg.	April 10, 1908	Monkey 210	..	Killed (dying) 77 days	Very slight disseminated tuberculosis consisting of a single miliary tubercle in a lung. Death due to severe tuberculosis of intestine and mesenteric glands.
,,	,,	930 days 23 days old, 18th generation	1·0 mg.	July 23, 1908	Monkey 218	Subcutaneous	Killed 95 days	General tuberculosis. Severe in the spleen.
,,	,,	320 days 21 days old, 15th generation	1·0 mg.	Nov. 21, 1906	Baboon 72	,,	Died 141 days	General tuberculosis. Not severe.
,,	,,	,, ,,	1·0 mg.	,,	Baboon 74	Fed	Killed 448 days	Condition good. Soft caseous nodules in a deep cervical and four mesenteric glands. A few small tubercles in the lung, liver, and kidney.

TABULAR SUMMARY OF INOCULATION EXPERIMENTS ON HORSES WITH CULTURES OF EQUINE TUBERCLE BACILLI.

Derived from the Original Material.

Virus.	Total Age of Culture: Age and Generation of Sub-culture Inoculated.	Dose.	Date of Inoculation.	Number of Horse.	Weight in Kilos.		Method of Inoculation.	Duration of Life.	Result.
					Initial.	Final.			
E. I.	782 days 22 days old, 26th generation	10·0 mg.	Feb. 11, 1908	16	87·52	61·22	Intravenous	Died 17 days	Acute tuberculosis. The lungs were congested and oedematous and showed a diffuse grey infiltration.
E. II.	788 days 21 days old, 31st generation	10·0 mg.	Feb. 17, 1908	18	76·18	63·19	Intravenous	Died 10 days	General tuberculosis.
"	" "	50·0 mg.	"	20	65·20	89·33	Subcutaneous	Killed 130 days	Local tuberculosis and a few scattered tubercles in the lungs, liver spleen and kidney.
E. IV	795 days 22 days old, 13th generation	50·0 mg.	Mar. 11, 1908	22	102·49	99·31	Subcutaneous	Killed (ill) 125 days	General tuberculosis.
"	" "	10·0 mg.	"	24	95·23	62·12	Intravenous (partly Subcutaneous)	Died 98 days	General tuberculosis. Severe in the lungs.

TABULAR SUMMARY OF INOCULATION EXPERIMENTS ON PIGS WITH CULTURES OF EQUINE TUBERCLE BACILLI.

All Subcutaneous.

Virus.	Source of Culture.	Total Age of Culture: Age and Generation of Sub-culture Inoculated.	Dose.	Date of Inoculation.	Number of Pig.	Weight in Kilos		Duration of Life.	Result.
						Initial.	Final		
E. I.	Original material	545 days 21 days old, 20th generation	10·0 mg.	June 20, 1907	192	24·03	20·40	Died 48 days	General tuberculosis.
E. II.	"	510 days 21 days old, 25th generation	10·0 mg.	May 15, 1907	184	12·69	53·96	Killed (when well) 268 days	General tuberculosis.
"	"	" "	50·0 mg.	"	186	19·50	28·57	Killed (when ill) 174 days	General tuberculosis.
E. III.	"	546 days 21 days old, 21st generation	10·0 mg.	May 20, 1907	194	24·03	24·92	Killed (very ill) 63 days	General tuberculosis.
E. IV.	"	195 days 20 days old, 23rd generation	10·0 mg.	May 15, 1907	188	17·68	59·39	Killed 268 days	General tuberculosis.
"	"	" "	50·0 mg.	"	190	18·58	47·15	Killed 175 days	General tuberculosis.

RABBITS INOCULATED WITH CULTURES DERIVED FROM THE ORIGINAL MATERIAL OF VIRUS E. I.

(*a*) Intravenous.

Virus.	Source of Culture.	Total Age of culture: Age and Generation of Sub-culture.	Dose.	Date.	Number of Rabbit.	Weight.		Duration of Life.	Result.
						Initial.	Final.		
E. I.	Original material	188 days 9th generation, 21 days old	1·0 mg.	June 27, 1906	**927**	1050	870	Died 12 days	General tuberculosis. The lungs, liver, spleen and kidneys contained numerous minute grey tubercles; the thoracic glands showed opaque foci in their cortices.
,,	,,	482 days 18th generation, 21 days old	1·0 mg.	April 17, 1907	**1310**	1180	850	Died 16 days	General tuberculosis.
,,	,,	,,	0·1 mg.	,,	**1309**	1400	1000	Died 19 days	General tuberculosis.
,,	,,	782 days 26th generation, 22 days old	0·1 mg.	February 11, 1908	**1639**	2470	1480	Died 24 days	General tuberculosis.
,,	,,	,,	0·01 mg.	,,	**1638**	3200	2080	Died 32 days	General tuberculosis.

(*b*) Intraperitoneal.

E. I.	Original material	188 days 9th generation, 21 days old	1·0 mg.	June 27, 1906	**930**	920	700	Died 19 days	General tuberculosis.
,,	,,	,,	1·0 mg.	,,	**931**	1150	800	Died 19 days	General tuberculosis.
,,	,,	482 days 18th generation, 21 days old	1·0 mg.	April 17, 1907	**1311**	1300	920	Died 32 days	General tuberculosis.

(*c*) Subcutaneous.

E. I.	Original material	188 days 9th generation, 21 days old	1·0 mg.	June 27, 1906	**933**	1020	1000	Died 73 days	General tuberculosis.
,,	,,	,,	0·1 mg.	,,	**934**	1000	1240	Died 75 days	General tuberculosis.
,,	,,	482 days 18th generation, 21 days old	10·0 mg.	April 17, 1907	**1314**	1200	820	Died 50 days	General tuberculosis.
,,	,,	,,	1·0 mg.	,,	**1312**	1100	770	Died 83 days	General tuberculosis.
,,	,,	,,	1·0 mg.	,,	**1313**	1150	1220	Died 139 days	General tuberculosis, rather more chronic than usual.
,,	,,	782 days 26th generation, 22 days old	10·0 mg.	Feb. 11, 1908	**1640**	1670	1030	Died 120 days	Chronic severe general tuberculosis.
,,	,,	,,	10·0 mg.	,,	**1641**	2050	2020	Died 64 days	General tuberculosis. Severe in lungs only.

GUINEA-PIGS INOCULATED WITH CULTURE DERIVED FROM VIRUS E. I.

Virus.	Source of Culture.	Total Age of Culture : Generation of Subculture.	Dose.	Date.	No. of G.P.	Mode of Inoculation.	Weight in Grammes.		Duration of Life.	Result.
							Initial.	Final.		
E. I.	Original material	188 days 9th generation, 21 days old	1·0 mg.	June 27, 1906	2110	Intrap.	380	320	Died 13 days	Acute tuberculosis.
„	„	„	1·0 mg.	„	2109	Subcut.	460	470	Died 42 days	General tuberculous.
„	„	„	0·1 mg.	„	2111	Subcut.	500	350	Died 56 days	General tuberculosis.
„	„	482 days 18th generation, 21 days old	1·0 mg.	April 17, 1907	2424	Subcut.	520	350	Died 42 days	General tuberculosis.
„	„	„	0·1 mg.	„	2423	Subcut.	580	400	Died 50 days	General tuberculosis.

RABBITS INOCULATED WITH CULTURES DERIVED FROM VIRUS E. II.

(*a*) Intravenous Inoculations.

Virus.	Source of Culture.	Total Age of Culture : Age and Generation of Subculture.	Dose.	Date.	Number of Rabbit.	Weight.		Duration of Life.	Result.
						Initial.	Final.		
E. II.	Original material.	130 days 7th generation, 21 days old	1·0 mg.	April 30, 1906.	838	2,150	1,270	Died 24 days.	The lungs were congested but air containing, and were closely filled by small translucent tubercles with opaque centres, often confluent. There were small early caseous nodules in the mediastinal glands. The spleen was enlarged, the Malpighian bodies were prominent and showed minute opaque centres. The kidneys were closely filled by grey translucent foci. There were opaque foci in the lumbar and iliac glands, and in one axillary gland.
„	„	„	0·1 mg.	„	839	2,000	1,040	Died 22 days.	The lungs were crepitant and contained numerous discrete translucent tubercles up to nearly 1·0 mm., all with some opacity in the centres. The thoracic glands contained patches of caseation. The spleen was enlarged and contained moderately numerous minute grey tubercles. A few grey foci were just visible in the liver. In the kidneys there were moderately numerous translucent tubercles some with minute opacities in the centre. There were scattered opaque foci in the lumbar, iliac and mesenteric glands.

RABBITS INOCULATED WITH CULTURES DERIVED FROM VIRUS E. II.—*continued.*

(*a*) INTRAVENOUS INOCULATIONS—*continued.*

Virus.	Source of Culture.	Total Age of Culture: Age and Generation of Sub-culture.	Dose.	Date.	Number of Rabbit.	Weight.		Duration of Life.	Result.
						Initial.	Final.		
E. II.	Original material.	405 days 19th generation, 21 days old	1·0 mg.	Jan. 29, 1907.	**1221**	3,500	1,980	Died 34 days.	The lungs were a little firm, oedematous, and fairly closely filled with translucent tubercles about half of which had minute caseous centres. The mediastinal glands were a little enlarged and showed a few caseous tubercles. No definite tubercles were seen in the spleen or liver. The kidneys contained numerous minute translucent tubercles in the cortices and a few in the medullae. Numerous greyish-white tubercles were seen in the fat of the axillary and inguinal regions, and in the peritoneal fat, and some were seen in the muscles.
,,	,,	510 days 25th generation, 21 days old	0·1 mg.	May 15, 1907.	**1331**	1,760	1,220	Died 127 days.	The lungs were partially collapsed: part of the posterior lobes was replaced by softening caseous substance containing small cavities: around the margins were softening caseous nodules: elsewhere the lung was congested and contained an occasional tubercle. The kidneys showed numerous small pits on the surface, and grey nodules containing a few opaque foci: in the pyramids there were numerous caseous streaks and both pelves contained caseo-pus. There was no tuberculosis elsewhere. (The lesions could not be distinguished from those produced by a a slightly virulent virus of human origin.)
,,	,,	635 days 7th generation, 22 days old	1·0 mg.	Sept. 17, 1907	**1466**	2,290	1,350	Died 57 days	The lungs were almost entirely consolidated and airless, being filled with confluent caseous tubercles. There were caseous patches in the bronchial glands. There were four minute tubercles in the spleen, and scattered foci in the liver. The cortices of the kidneys were filled with minute tubercles and there were a few in the medullae. There were occasional opaque foci seen in the lymphatic glands, in the tissues of the axillary and inguinal regions, and on the peritoneum.
,,	,,	,,	0·1 mg.	,,	**1467**	1,820	1,470	Died 54 days.	The lungs were large and were closely filled with caseous nodules with grey margins: in the posterior lobes the caseous substance was becoming soft and there were several small cavities: the bronchioles contained muco-pus. In each bronchial gland a caseous focus was seen. The spleen contained scattered minute opaque tubercles and the liver a moderate number; in the kidneys numerous grey caseating submiliary tubercles were seen.
,,	,,	,,	0·1 mg.	,,	**1469**	1,850	1,320	Died 38 days.	The lungs were reddish-grey and solid, being filled with grey caseating tubercles. The spleen was greatly enlarged and filled with caseous tubercles. The liver contained a moderate number of minute grey foci, the kidneys moderately numerous minute caseating tubercles. (Acute tuberculosis.)
,,	,,	788 days 31st generation, 21 days old	1·0 mg.	Feb. 17, 1908.	**1659**	1,730	1,150	Died 32 days.	The lungs were oedematous and contained moderately numerous small grey translucent tubercles, many with caseous centres. The thoracic glands showed small caseous patches and foci. The spleen was swollen and its substance was firm; scattered foci were visible beneath the capsule. The liver showed a moderate number of grey points; in the kidneys there were numerous irregular grey tubercles. Tubercles were seen in the areolar tissues and in several abdominal glands.
,,	,,	,,	0·1 mg.	,,	**1658**	1,290	920	Died 22 days.	The lungs were pinkish-grey and firm, and filled with grey tubercles with yellow caseous centres. The thoracic glands showed caseous patches and foci. The spleen contained a moderate number of greyish-white tubercles, the liver was filled with discrete grey foci, and the kidneys showed numerous grey tubercles, many with opaque centres. There were caseous foci in many lymphatic glands.

E. II.	Original material.	841 days 14th generation, 20 days old	0·1 mg.	April 10. 1908.	1724	1,740	1,150	Died 58 days.	The lungs were to a great extent replaced by firm grey tissue beset with caseous patches and foci: elsewhere they contained numerous caseous tubercles. The bronchial glands were enlarged and contained caseous nodules. The spleen contained sparsely scattered opaque tubercles, the liver a few grey foci; the cortices of the kidneys were beset with grey tubercles with caseous centres, and there were caseous tubercles and streaks in the deeper parts of the cortices and in the medullae. There were caseous tubercles on the dorsal peritoneum, and a few in the axillary region. One inguinal gland showed an opaque focus.
..	..		0·01 mg.	..	1722	1,670	1,170	Died 36 days.	General tuberculosis of the usual type.
..	..	945 days 17th generation, 23 days old	1·0 mg	July 23, 1908.	1849	2,520	1,700	Died 20 days.	Early general tuberculosis.
..	..		1·0 mg.	,,	1850	2,200	1,000	Died 33 days.	General tuberculosis of the usual type.

(*b*) Intraperitoneal Inoculations.

E. II.	Original material.	130 days 7th generation, 21 days old	1·0 mg	April 30. 1906.	840	1,600	1,020	Died 29 days.	Omentum thickened, retracted and more than half caseous. The peritoneum, parietal and visceral, was irregularly covered with minute grey tubercles. The lungs were crepitant and contained numerous minute grey tubercles with opaque centres. The mediastinal glands were caseous. The spleen was large, containing numerous minute grey foci; the Malpighian bodies were enlarged and opaque in the centres. The liver was closely filled with minute grey foci just visible. The kidneys contained moderately numerous minute translucent tubercles. The lumbar and iliac glands contained small caseous tubercles, and the mesenteric glands a few minute opaque foci.
,,	..		0·1 mg.	..	841	1,120	1,100	Died 43 days.	The omentum was thickened and consisted of translucent cords with caseous streaks and foci. On the peritoneum there were greyish opaque tubercles. The lungs were oedematous and contained a moderate number of grey tubercles with opaque centres. There were caseous tubercles and patches in the thoracic glands. The kidneys and liver contained moderately numerous minute grey tubercles. The spleen was slightly enlarged, and contained moderately numerous greyish, opaque subminiliary tubercles. The lumbar glands were partly caseous: the mesenteric, iliac and axillary glands contained opaque foci. In the areolar tissues of the submaxillary, axillary and inguinal regions there were opaque tubercles.
..	..	405 days 19th generation, 21 days old	1·0 mg.	January 29, 1907.	1222	3,300	1,500	Died 88 days.	The omentum showed caseous nodules on the free margin. The parietal peritoneum showed opaque tubercles irregularly distributed: on the visceral peritoneum there were numerous small caseous nodules, confluent on the mesentery. The lungs were pink and a little oedematous; the margins were slightly caseous: there were minute grey tubercles on the surface, and a group of caseous tubercles in one posterior lobe. The mediastinal glands were enlarged and in part caseous. The spleen was severely affected with pseudo-tuberculosis. The surface of the kidneys was pitted; some of the depressions were grey with an opaque focus in the centre: there were also a few caseous streaks in the pyramids. The diaphragm contained caseous nodules There were tubercles in the ribs, and soft caseous nodules in the inguinal glands.

RABBITS INOCULATED WITH CULTURES DERIVED FROM VIRUS E. II.—*continued.*

(*c*) Subcutaneous Inoculations.

Virus.	Source of Culture.	Total Age of Culture : Age and Generation of Sub-culture.	Dose.	Date.	No. of Rabbit.	Weight.		Duration of Life.	Result.
						Initial.	Final.		
E. II.	Original material.	130 days 7th generation, 21 days old	1·0 mg.	April 30, 1906.	842	790	1,360	Killed 111 days.	In the subcutaneous tissues of the abdominal wall there were some small thin-walled cysts containing caseo-pus. The inguinal and axillary glands were enlarged and contained nodules of curdy substance, which shelled out leaving apparently normal gland tissue. In the lungs one translucent nodule with caseous foci and four small tubercles were seen.
,,	,,		0·1 mg.	,,	843	800	1,400	Killed 112 days.	At the seat of inoculation (abdomen) there were three small thin-walled cysts containing caseo-pus. The adjacent inguinal and axillary glands were enlarged and contained each two nodules of curdy substance, which shelled out of cavities in the gland. In the lung one pea-sized translucent nodule with opaque foci in the centre was seen.
,,	,,	335 days 16th generation, 21 days old	10·0 mg.	Nov. 20, 1906.	1083	1,950	2,440	Killed 102 days.	In the subcutaneous tissues of the back there was a baggy cyst containing caseo-pus ; there was no infiltration or ulceration. The axillary glands were enlarged and consisted of cysts containing fluid and very little caseous substance. The lungs were crepitant and showed on the surface a moderate number of grey nodules diffusely caseous in the centre up to 7 mm. in diameter. Each kidney contained two or three grey tubercles with caseous centres.
,,	,,		1·0 mg.	,,	1082	1,950	2,320	Killed 102 days.	At the seat of inoculation (back) there was a small almost healed ulcer. The axillary glands were enlarged, containing soft curdy caseous nodules in a serous fluid. The lungs showed five small collections of grey nodules with opaque foci in the centre. In a pyramid of one kidney there was a minute tubercle. In the mid-dorsal region of the spinal cord there was a caseous nodule (T.B. numerous) causing practically complete section of the cord. (In life there had been complete paralysis of the lower limbs.)
,,	,,		0·1 mg.	,,	1081	2,200	2,340	Killed 102 days.	At the seat of inoculation (back) there was a cyst similar to that in Rabbit 1083. The axillary glands were enlarged and contained curdy caseous nodules, and in one case caseous gritty streaks. The lungs were crepitant and showed on the surface beneath the pleura, sparsely scattered translucent nodules with caseous centres up to a wheat grain in size. There was a soft yellow caseous streak in the pyramid of one kidney, and no tuberculosis elsewhere.
,,	,,	405 days 19th generation, 21 days old	10·0 mg.	Jan. 29, 1907.	1223	3,600	2,820	Died 37 days.	At the seat of inoculation (back) there was a cyst containing soft caseous substance. There was no tuberculosis elsewhere. Death was caused by purulent pleurisy of the left lung.
,,	,,	510 days 25th generation, 21 days old	1·0 mg.	May 15, 1907.	1330	1,900	2,000	Died 265 days.	At the seat of inoculation (abdomen) there were a few small purulent nodules, and the left inguinal gland showed a few caseous foci. A considerable part of the inoculum had entered the peritoneal cavity and there were moderately numerous tubercles on the peritoneum and omentum. The lungs were congested and fairly closely filled with grey caseating nodules ; part of the margins was caseous. The enlarged mediastinal glands showed an occasional opaque focus. The diaphragm was represented by a mass of firm caseated tissue, and the parietal pleura was to a great extent covered with similar tissue. The kidneys showed in the cortices moderately numerous caseating tubercles.

E. II.	Original material	635 days [illegible]h generation, 22 days old	50·0 mg.	Sept. 17, 1907.	**1470**	2,200	1,550	Died 106 days.	At the seat of inoculation (back) there was a large cyst filled with soft caseous substance. One left axillary gland showed part of the cortex caseous. The lungs collapsed well; they showed on the surface some grey tubercles with caseous centres, and at the extremities and margins of the lobes caseous nodules; in the anterior and middle lobes more than half the substance was occupied with grey tissue beset with caseous foci. The kidneys were pitted and showed on the surfaces scattered translucent foci; there was a grey nodule with caseous centre in the cortex, caseous streaks in the pyramids, and a little caseous substance in the pelves. There was a doubtful focus in the spleen, the liver was normal. (Apparently retrogressive tuberculosis.)
"	"		10·0 mg.	"	**1471**	1,830	2,200	Killed 140 days.	At the seat of inoculation (back) there was a thick-walled cyst filled with caseous substance. The skin was infiltrated and ulcerated. The enlarged scapular gland contained soft caseous foci. The lungs were a little oedematous and showed caseation along part of the margins and scattered minute translucent tubercles on the surface. There were calcareous foci in the mediastinal glands and caseating tubercles in the diaphragm. The kidneys showed scattered congested pits, beneath many of which in the pyramids were caseous streaks; a few minute caseating tubercles were also seen.
"	"		1·0 mg.	"	**1468**	1,540	2,300	Killed 140 days.	At the seat of inoculation (back) there was a soft caseo-purulent tumour adherent to ulcerated skin. The adjacent scapular gland was enlarged and purulent. The lungs were congested and oedematous and were closely filled with grey caseating tubercles varying from a point to a pea in size. The kidneys were studded with projecting caseous nodules up to a large pea in size. An occasional opaque centre was seen in the Malpighian bodies of the spleen. There were a few caseating nodules on the parietal pleura and diaphragm.
"	"	788 days 31st generation, 21 days old	10·0 mg.	Feb. 17, 1908.	**1660**	1,500	870	Died 110 days.	There was a cystic tumour filled with caseo-pus at the seat of inoculation, and the adjacent glands showed one or two tubercles in each. The anterior lobes of the lungs were dark red, solid and beset with caseous foci around the margins; the posterior lobes showed a few caseating tubercles on the surface and the margins were occupied by caseating nodules. The kidneys each showed scattered pits on the surface and a few caseous tubercles in the cortex and medulla. The bronchial glands were oedematous. There were softening caseous tubercles on the dorsal peritoneum and in the inguinal, axillary and pubic regions. (The disease was of the type produced by the intravenous inoculation of slightly-virulent viruses.)
"	"	841 days 14th generation, 20 days old	10·0 mg.	April 10, 1908.	**1723**	1,410	1,000	Died 59 days.	There was a small caseous softened local tumour the skin over which was ulcerated. The adjacent glands contained softening caseous nodules. In the lungs which were oedematous there were about eighteen grey tubercles with caseous centres; the bronchial glands were partly caseous. The kidneys contained a few translucent tubercles with caseous centres. No tubercles were seen in the other organs and glands. The cause of death was not obvious.
"	"		10·0 mg.	"	**1725**	1,170	1,020	Died 45 days.	There was a caseous tumour at the seat of inoculation, and the adjacent glands were enlarged and caseous. The lungs contained sparsely scattered caseating tubercles up to a millet seed in size, and there were a few minute caseating tubercles in the kidneys; the spleen showed a few minute foci. Other organs and glands were normal. The cause of death was not obvious.
"	"		10·0 mg.	"	**1726**	1,050	2,340	Killed 178 days.	There was a small scar, and a few caseo-purulent nodules in the subcutaneous tissues at the seat of inoculation. The scapular glands were large thin-walled cysts filled with caseo-pus. The axillary glands contained a few caseous foci. There were a few marginal nodules, and scattered tubercles on the surface of the lungs and at each caudal extremity there was a caseo-calcareous nodule. There were some minute grey foci in the kidneys. Other organs and glands were normal. The rabbit was in good condition.

GUINEA-PIGS INOCULATED WITH CULTURES FROM VIRUS E. II.

(*a*) Intraperitoneal.

Virus.	Source of Culture.	Total Age of Culture: Age and Generation of Subculture.	Dose.	Date.	Number of Guinea-pig.	Weight in Grammes.		Duration of Life.	Result.
						Initial.	Final.		
E. II.	Original material through a guinea-pig.	130 days 7th generation, 21 days old	0·1 mg.	April 30, 1906	**1978**	420	250	Died 40 days	General tuberculosis.

(*b*) Subcutaneous.

E. II	Original material through a guinea-pig.	130 days 7th generation, 21 days old	0·1 mg.	April 30, 1906	**1977**	420	270	Died 66 days	General tuberculosis.
"	"	335 days 16th generation, 21 days old	1·0 mg.	Nov. 20, 1906	**2214**	340	240	Died 44 days	General tuberculosis.
			0·1 mg.	"	**2213**	470	420	Died 77 days	General tuberculosis.
"	"	510 days 25th generation, 21 days old	1·0 mg.	May 15, 1907	**2485**	1,020	780	Died 133 days	General tuberculosis of a very chronic type.
			0·1 mg.	"	**2486**	900	550	Died 212 days	General tuberculosis of a very chronic type.

RABBITS INOCULATED WITH CULTURES DERIVED FROM VIRUS E. III.

(*a*) Intravenous Inoculations.

Virus.	Source of Culture.	Total Age of Culture: Age and Generation of Subculture.	Dose.	Date.	Number of Rabbit.	Weight.		Duration of Life.	Result.
						Initial.	Final.		
E. III.	Original material through a guinea-pig.	188 days 9th generation, 21 days old	1·0 mg.	June 27, 1906.	**935**	1,370	1,270	Died 12 days.	The lungs were congested and oedematous and contained numerous minute grey tubercles. In the liver numerous minute foci were just visible; scattered grey points could be seen in the kidneys; the spleen was moderately enlarged but no tubercles were visible in it.

,,	,,	,,	0·1 mg.	,,	**936**	1,440	1,140	Died 31 days.	The lungs were congested, oedematous, and closely beset with small greyish tubercles; the kidneys contained moderately numerous small greyish tubercles; in the liver there were numerous minute foci; the spleen was enlarged and closely filled with small irregular opaque tubercles. The mediastinal glands contained caseous nodules; many other lymphatic glands contained opaque foci or small tubercles.
,,	,,	410 days 18th generation, 21 days old	1·0 mg.	Feb. 4, 1907.	**1234**	1,000	990	Died 15 days.	The lungs were irregularly congested and oedematous, and contained numerous minute grey tubercles, in places confluent. In the liver there were numerous grey points just visible. The spleen was slightly enlarged, and the Malpighian bodies prominent. There were minute caseous foci in the mediastinal glands which were congested and oedematous.

(*b*) Intraperitoneal Inoculations.

F. III.	Original material through a guinea-pig.	188 days 9th generation, 21 days old	1·0 mg.	June 27, 1906.	**939**	1,170	900	Died 21 days.	Severe tuberculous peritonitis. The spleen was enlarged and firm; a few grey points were visible in it, and also in the kidneys. In the liver numerous grey foci were visible. The mesenteric, lumbar, and iliac glands were enlarged; the latter showed opaque foci in the cortices. There were scattered foci in the lungs, and two mediastinal glands were caseous.
,,	,,	,,	0·1 mg.	,,	**940**	1,290	2,320	Killed 99 days.	There was a cyst in the subcutaneous tissues, and a caseous lesion in the abdominal wall at the seat of inoculation. The omentum showed discrete greyish opaque tubercles. The liver contained a few similar tubercles. In the kidneys there were numerous large projecting tubercles, composed of translucent tissues with a small amount of caseation in the centre. The lungs were closely filled with grey translucent tubercles with opaque centres.
,,	,,	410 days, 18th generation, 21 days old	1·0 mg.	February 4, 1907.	**1235**†	1,250	1,250	Died 188 days.	There was a soft caseous nodule in the skin, and a flattened caseous patch in the abdominal muscles at the seat of inoculation; the inguinal glands showed caseous nodules. The omentum and peritoneum were normal. Each kidney contained a few wedge-shaped caseous nodules projecting on the surface. The liver showed scattered grey tubercles and a single caseous nodule. There was a caseous nodule in the wall of the caecum and the blind end of the caecum showed a few similar nodules. There was a moderate number of flattened yellowish nodules on the diaphragmatic and right costal pleura. The lungs showed a moderate number of irregular caseous nodules with grey margins. The bronchial glands showed caseous foci; the tuberculosis was not severe enough to account for death.

(*c*) Subcutaneous Inoculations.

E. III.	Original material through a guinea-pig.	188 days 9th generation, 21 days old	1·0 mg.	June 27, 1906.	**941**	1,230	1,220	Died 75 days.	There was a caseous ulcer at the seat of inoculation, and the left inguinal gland was partly caseous. The lungs contained numerous discrete translucent tubercles with opaque centres. The kidneys contained scattered translucent tubercles with very little central caseation. The liver and spleen showed each a single tubercle. The left axillary gland contained soft caseous nodules; the ventral mediastinal gland a single opaque focus. There was no tuberculosis elsewhere.

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† Inoculation partly intramuscular and perhaps intracaecal.

RABBITS INOCULATED WITH CULTURES DERIVED FROM VIRUS E. III.—*continued.*

(*c*) SUBCUTANEOUS INOCULATIONS—*continued.*

Virus.	Source of Culture.	Total Age of Culture: Age and Generation of Sub-culture.	Dose.	Date.	Number of Rabbit.	Weight.		Duration of Life.	Result.
						Initial.	Final.		
E. III.	Original material through a guinea-pig.	188 days 9th generation, 21 days old	0·1 mg.	June 27, 1906.	942	950	1 450	Died 106 days.	There was a tumour the size of a hen's egg at the seat of inoculation composed of caseated tissue, and with a central cavity. The lungs were firm and did not collapse, they were infiltrated with small caseous areas with confluent grey margins, the anterior lobes being quite solid. The kidneys were closely filled with large projecting caseous nodules with translucent margins. The liver showed one minute tubercle. The inguinal, axillary and left iliac glands were extensively caseous and softened.
,,	,,	410 days 18th generation, 21 days old	10·0 mg.	February 4, 1907.	1232	2,450	1,650	Died 69 days	General tuberculosis.
			1·0 mg.	,,	1233	1,100	920	Died 121 days.	There was a large cystic tumour containing soft caseous substance at the seat of inoculation, and there were caseous patches in the axillary and inguinal glands. The lungs contained irregular caseous nodules in the margins, and in the substance a moderate number of caseous nodules with grey margins and of grey tubercles. In each kidney there were scattered grey tubercles and two grey wedge-shaped nodules diffusely caseous. The mediastinal glands contained gritty caseous nodules.

GUINEA-PIGS INOCULATED WITH CULTURES DERIVED FROM VIRUS E. III.

(*a*) Intraperitoneal.

Virus.	Source of Culture.	Total Age of Culture: Generation and Age of Sub-culture.	Dose.	Date.	Number of Guinea-pig.	Weight in Grammes.		Duration of Life.	Result.
						Initial.	Final.		
E. III.	Original material through a guinea-pig.	188 days 9th generation, 21 days old	1·0 mg.	June 27, 1906	2114	430	350	Died 24 days	General tuberculosis.
,,	,,	,,	0·1 mg.	,,	2116	420	400	Died 28 days	General tuberculosis.

E. III.	,,	410 days 18th generation, 21 days old	1·0 mg.	February 4, 1907.	2361	320	250	Died 16 days	Acute tuberculosis.
,,	,,	,,	1·0 mg.	,,	2362	270	170	Died 8 days	Acute tuberculosis.
,,	,,	,,	1·0 mg.	,,	2363	350	270	Died 12 days	Acute tuberculosis.
,,	,,	,,	1·0 mg.	,,	2364	270	320	Died 10 days	Acute tuberculosis.
,,	,,	,,	1·0 mg.	,,	2365	290	240	Died 12 days	Acute tuberculosis.
,,	,,	,,	1·0 mg.	,,	2366	270	190	Died 11 days	Acute tuberculosis.

(*b*) Subcutaneous.

E. III.	Original material through a guinea-pig.	188 days 9th generation, 21 days old	1·0 mg.	June 27, 1906	2113	480	420	Died 78 days	General tuberculosis.
,,	,,	,,	0·1 mg.	,,	2115	520	400	Died 94 days	General tuberculosis.

RABBITS INOCULATED WITH CULTURES DERIVED FROM VIRUS E. IV.

(*a*) Intravenous Inoculations.

Virus.	Source of Culture.	Total Age of Culture: Age and Generation of Subculture.	Dose.	Date.	Number of Rabbit.	Weight.		Duration of Life.	Result.
						Initial.	Final.		
E. IV.	Original material.	115 days 6th generation, 21 days old	1·0 mg.	April 30, 1906.	845	1,710	1,050	Died 19 days.	The lungs were congested, one more than the other, and several pieces sank in water; they were closely filled with minute grey tubercles, giving the substance a grey solid appearance. The thoracic glands appeared normal. The spleen was enlarged, and contained very numerous grey foci; in the liver very minute foci were just visible. In the kidneys there were numerous translucent foci with opaque centres. One axillary gland contained a few minute foci.
,,	,,	,,	0·1 mg.	,,	844	1,620	1,020	Died 23 days.	The lungs were a little congested but air-containing; they were fairly closely filled by small grey tubercles with opaque centres. There was an opaque focus in the heart muscle, and caseous nodules in the mediastinal glands. The spleen was greatly enlarged; very numerous grey foci were seen beneath the capsule; the Malpighian bodies were enlarged. The liver contained numerous minute grey foci: the kidneys there were moderately numerous small tubercles, mostly opaque in the centre. The lumbar glands contained caseous nodules; there were opaque foci in the iliac glands. Smears from spleen and liver showed numerous T.B.

RABBITS INOCULATED WITH CULTURES DERIVED FROM VIRUS E. IV.—*continued.*

(*a*) INTRAVENOUS INOCULATIONS—*continued.*

Virus.	Source of Culture.	Total Age of Culture: Age and Generation of Subculture.	Dose.	Date.	Number of Rabbit.	Weight.		Duration of Life.	Result.
						Initial.	Final.		
E. V.	Original material.	390 days 18th generation, 21 days old	1·0 mg.	Jan. 30, 1907.	**1219**	1,050	740	Died 14 days.	The lungs were oedematous and irregularly congested; grey foci were visible in the congested areas, and two small caseous patches were seen. No tubercles were visible in the abdominal organs. Smears from the liver and spleen showed moderately numerous T.B.; one from the lung showed very numerous T.B.
"	"	495 days 23rd generation, 20 days old	0·1 mg.	May 15, 1907.	**1333**	2,000	1,030	Died 78 days.	The lungs were pinkish and collapsed normally: they showed moderately numerous grey tubercles with minute caseous centres; the mediastinal glands contained caseous foci. There were a few minute yellow foci in the spleen, and in the liver a number of minute grey foci and a few larger tubercles. The kidneys each showed on the surface numerous depressions which corresponded to tubercles deeper in the cortex; some of these extended as radial streaks into the medulla. No T.B. were seen in a smear from the liver substance.
"	"	620 days 8th generation, 22 days old	1·0 mg.	Sept. 17, 1907.	**1475**	2,070	1,620	Died 32 days.	The lungs were reddish-grey, solid, and closely filled with confluent translucent tubercles with caseous centres; the liver was speckled with minute tubercles; the kidneys contained numerous grey tubercles, the majority caseous in the centre; the spleen was moderately enlarged and the Malpighian bodies too were enlarged, the majority showing minute opaque centres.
"	"	"	0·1 mg.	"	**1476**	1,830	1,790	Died 20 days.	The lungs did not collapse normally; the substance was beset with translucent tubercles, some with minute opaque centres. The bronchial glands showed small necrotic patches. The spleen was greatly enlarged and speckled with grey tubercles; the liver showed numerous minute foci; the kidneys contained moderately numerous translucent tubercles.
"	"	"	0·1 mg.	"	**1477**	1 420	1,230	Died 18 days.	The lungs were firm, reddish-grey, and almost airless, and closely filled with confluent translucent tubercles with minute caseous centres. The bronchial glands contained small caseous patches. The spleen was enlarged and speckled with grey foci; minute grey tubercles were fairly numerous in the kidneys; grey points were just visible in parts of the liver.
"	"	796 days 13th generation, 22 days old	1·0 mg.	March 11, 1908.	**1699**	2,260	1,600	Died 32 days.	The lungs were firm and consisted of reddish-grey tissue speckled with irregular opaque caseous foci; the bronchial glands contained caseous patches. The spleen was slightly enlarged, the Malpighian bodies were prominent and showed scattered minute opaque foci. The cortices of the kidneys were closely filled with minute translucent tubercles, some with central opacities; the liver contained scattered irregular grey foci. There were minute caseating tubercles widely scattered in the areolar tissues, and there was an occasional minute opaque focus in the peripheral glands.
"	"	"	0·1 mg.	"	**1698**	2,190	1,530	Died 79 days.	General tuberculosis resembling that following a subcutaneous inoculation of bovine tubercle bacilli.
"	"	826 days 15th generation, 20 days old	0·01 mg.	April 10, 1908.	**1728**	1,940	1,480	Died 53 days.	The lungs were closely filled with confluent grey nodules with caseous centres. The spleen, liver, and kidneys were closely beset with caseous tubercles and nodules. The bronchial and portal glands contained caseous patches and foci. Other abdominal and the peripheral glands each showed a number of caseous foci,

,,	,,	930 days 18th generation, 23 days old	1·0 mg.	July 23, 1908.	1851	2,200	1,890	Died 18 days.	Acute tuberculosis. The lungs were closely beset with minute grey caseating tubercles; the spleen was greatly enlarged, firm, and dark in colour; the liver was pale; the kidneys showed numerous minute translucent foci in the cortices.
,,	,,	,,	1·0 mg.	,,	1852	2,240	1,690	Died 18 days.	Acute tuberculosis similar to No. 1851.
(*b*) **Intraperitoneal Inoculations.**									
E. IV.	Original material.	115 days 6th generation, 21 days old	1·0 mg.	April 30, 1906.	846	1,620	850	Died 28 days.	Small caseous local lesion in subcutaneous tissue. The omentum was moderately thickened and considerably caseated. Minute grey tubercles were irregularly distributed over the peritoneum. The lungs were crepitant and contained moderately numerous minute grey foci; the mediastinal glands were enlarged and caseous. The spleen was slightly enlarged and the Malpighian bodies prominent; a few were opaque in the centre. The kidneys showed numerous discrete translucent foci. There were caseous foci in many abdominal glands and minute opaque foci in the peripheral glands.
,,	,,	,,	0·1 mg.	,,	848	1,300	950	Died 47 days.	Small caseous local lesion. The omentum was thickened by delicate translucent tissue with caseous streaks and foci. On the visceral peritoneum there were numerous small greyish-white tubercles. The lungs were crepitant and contained a moderate number of minute translucent tubercles with opaque centres. The mediastinal glands were enlarged and in part caseous. The spleen was small, and contained a few minute tubercles; in each kidney about half a dozen were seen. The lumbar, iliac and mesenteric glands were slightly enlarged and contained caseous tubercles. There were caseous foci in the axillary, submaxillary and inguinal glands.
,,	,,	390 days 18th generation, 21 days old	1·0 mg.	Jan. 30, 1907.	1220	1,070	800	Died 96 days.	The omentum was moderately thickened and partly caseous. There were scattered miliary caseous tubercles on the peritoneum, and in the caecum a pea-sized caseous nodule ulcerated internally. The lungs were fairly closely beset with irregular caseous nodules with grey margins; the mediastinal glands were caseous almost throughout; so also were the lumbar and iliac. The spleen, slightly enlarged, contained moderately numerous caseous miliary tubercles. The kidneys were beset with grey nodules, up to a pea in size, with caseous centres. There were small caseous nodules in the skin and abdominal muscles. The right axillary and the mesenteric glands contained caseous tubercles. There was psorospermosis of the liver, rather severe.
(*c*) **Subcutaneous Inoculations.**									
E. IV.	Original material.	115 days 6th generation, 21 days old	1·0 mg.	April 30, 1906.	847	1,300	1,770	Killed 112 days.	At the seat of inoculation there was a soft caseous tumour the size of a sparrow's egg; scattered around it were some caseo-purulent nodules. The left inguinal and axillary glands were enlarged and distended with a clear mucinous fluid and curdy pus. The left iliac gland contained soft caseous nodules. In the lungs there were five miliary tubercles with caseous centres. T.B. were seen in smears from the lung and inguinal gland; none in a smear from the local lesion.
,,	,,	,,	0·1 mg.	,,	849	940	1,720	Killed 112 days.	At the seat of inoculation there was a thin-walled cyst containing caseo-pus; in the overlying skin a minute ulcer was seen. The left inguinal gland was large, oedematous, and showed curdy caseous nodules containing calcareous grains. There was a small nodule in the right inguinal gland. In the lungs there were four scattered translucent tubercles with opaque centres and two small translucent nodules with opaque foci.

RABBITS INOCULATED WITH CULTURES DERIVED FROM VIRUS E. IV.—*continued.*

(*c*) Subcutaneous Inoculations.—*continued.*

Virus.	Source of Culture.	Total Age of Culture: Age and Generation of Subculture.	Dose.	Date.	Number of Rabbit.	Weight.		Duration of Life.	Result.
						Initial.	Final.		
E. IV.	Original material.	320 days 15th generation, 21 days old	20·0 mg.	Nov. 21. 1906.	1080	2,600	2,300	Killed 100 days (paralysed).	At the seat of inoculation there was a small ulcer with a central sinus, and a small softened caseous nodule in the subcutaneous tissues. The scapular glands contained caseo-purulent cysts; the axillary glands were enlarged without opacities. The lungs were congested and oedematous; they showed fairly numerous translucent tubercles and nodules with caseated centres, and also two pea-sized gritty caseous nodules. There were a few caseous tubercles in the mediastinal glands and two small translucent growths on the pleura. The kidneys showed in the cortices scattered translucent tubercles up to a hemp seed in size, the larger with a little central caseation; a few were continued into the pyramids as soft caseous streaks. In the spinal cord in the lumbar region there was a caseous abscess (T.B. were numerous in a smear from it) affecting rather more than half the transverse section and 3 mm. in length. The hind legs had been paralysed during life, and the bladder was found to be distended with urine.
"	"	"	10·0 mg.	"	1079	2,200	1,500	Died 39 days.	There was a large circular hole in the skin of the back at the seat of inoculation leading to a wide-spreading cavity lined by foul-smelling caseo-purulent substance; this substance extended on to the front of the chest and the abdomen. The axillary glands were enlarged and replaced by soft caseous substance. The lungs contained sparsely-scattered small translucent tubercles, some opaque in the centre. There were caseous foci in two mediastinal glands and caseous tubercles in the portal glands (smears from these glands showed numerous T.B.). The abdominal organs were normal.
"	"	"	1·0 mg.	"	1078	2,150	2,120	Died 46 days.	There was a large ulcer in the skin of the back. The axillary glands were enlarged and contained soft caseous foci. Other adjacent glands were also enlarged and contained softening caseous nodules. The lungs contained sparsely scattered minute translucent foci and a few tubercles with grey margins and caseous centres; in the mediastinal glands minute caseous foci were seen. In the spleen three tubercles were seen; there was an occasional focus in the liver and a few scattered grey tubercles in the kidneys. The portal glands showed opaque foci.
"	"	390 days 18th generation, 21 days old	20·0 mg.	Jan. 30, 1907.	1218	1,170	800	Died 35 days.	There was a large ulcerated area in the skin of the back. The axillary glands on one side were caseous throughout; on the other side they contained caseous tubercles. The lungs showed moderately numerous minute translucent tubercles with caseous centres; minute opaque tubercles were moderately numerous in the spleen and kidneys; there were caseous tubercles in the mediastinal, lumbar. and iliac glands.

,,	,,	390 days 18th generation, 21 days old	10·0 mg.	Jan. 30, 1907.	1217	3,470	1,680	Died 150 days.	At the site of inoculation there was a healing ulcer and a few small caseous nodules ; the nearest axillary gland was composed of yellow purulent substance. The lungs were congested and collapsed partially, the substance being in places replaced by soft caseous nodules, and elsewhere containing moderately numerous discrete caseous tubercles ; on the dorsal surface of each lung there was a long caseous patch. The kidneys showed a moderate number of grey nodules with soft caseous centres, the larger projecting on the surface and extending as caseo-purulent streaks into the substance ; large irregular depressed areas of the cortex were also seen. There were a few soft caseous nodules on the peritoneum near the kidneys. The thoracic and abdominal glands were normal.
,,	,,	,,	1·0 mg.	,,	1216	3,450	2,020	Died 154 days.	At the site of inoculation there was a baggy cyst filled with soft caseous substance. Each axillary gland contained two small tubercles. The left submaxillary gland was partly caseous and softened. The lungs contained moderately numerous small caseous nodules and minute translucent tubercles ; the margins were extensively replaced by caseous substance. The kidneys were pitted on the surfaces and showed numerous small grey nodules with caseous centres, some extending inwards as caseous streaks. There were caseous nodules in the thyroid body, and a few caseous tubercles in the axillary and inguinal areolar tissues.
,,	,,	495 days 23rd generation, 20 days old	1·0 mg.	May 15, 1907.	1332	2,150	2,740	Killed 265 days.	In the subcutaneous tissue of the abdomen there was a tumour composed of yellowish tissue beset with purulent nodules. The left axillary gland was enlarged and filled with muco-purulent substance. The lungs were congested, collapsed partially, and were fairly closely filled with caseating nodules and caseous areas ; there were translucent growths caseating in the centre on the pleura. The kidneys contained moderately numerous projecting, caseating nodules up to a pea in size. The rabbit was fat and in good condition.
,,	,,	620 days 8th generation, 22 days old	50·0 mg.	Sept. 17, 1907.	1474	2,040	1,510	Died 130 days.	There were two cystic nodules in the subcutaneous tissues of the back ; in one axillary gland there was a small caseous gritty nodule, and each ventral mediastinal gland showed a similar nodule. In the lungs there were two small caseous tubercles and an occasional transparent focus. Each kidney showed two or three small grey nodules, each with a caseous streak running through the pyramids ; the nodules were surrounded by depressions and were apparently becoming healed.
,,	,,	,,	10·0 mg.	,,	1472	1,970	1,520	Died 137 days.	In the skin of the back there was a shallow ulcerated area ; one axillary gland contained an opaque focus. The lungs showed a firm friable caseous nodules up to a pea in size, situated mainly in the margins. A few caseating tubercles and caseous streaks were seen in the kidneys. A smear from a lung nodule showed T.B. in moderate numbers. There was no tuberculosis elsewhere.
,,	,,	,,	1·0 mg.	,,	1473	1,690	2,250	Killed 140 days.	In the subcutaneous tissues of the back there was a collection of cystic caseo-purulent nodules, the largest the size of a sparrow's egg ; one scapular gland contained opaque foci, and a ventral mediastinal gland showed a purulent nodule. The extremity of the right anterior lobe of the lung was replaced by firm grey tissue beset with opaque foci ; that of the posterior lobe was congested, oedematous and showed a few opaque foci. The left lung contained a caseating nodule and a miliary tubercle.
,,	,,	796 days 13th generation, 22 days old	10·0 mg.	Mar. 11, 1908.	1695	1,230	1,370	Died 87 days.	There was a large ulcerated baggy cyst at the seat of inoculation containing soft caseous substance ; the left axillary gland was cystic and filled with caseo-pus. Each kidney contained four grey nodules with soft caseous centres ; there were four minute caseating tubercles in the lung. There were no tuberculosis elsewhere ; the cause of death was not apparent.

RABBITS INOCULATED WITH CULTURES DERIVED FROM VIRUS E. IV.—*continued.*

(*c*) Subcutaneous Inoculations—*continued.*

Virus.	Source of Culture.	Total Age of Culture: Age and Generation of Sub-culture.	Dose.	Date.	Number of Rabbit.	Weight.		Duration of Life.	Result.
						Initial.	Final.		
E. IV.	Original material.	796 days 13th generation, 22 days old	**10·0 mg.**	Mar. 11, 1908.	**1696**	1,070	820	Died 164 days.	There was a small local tumour composed of a number of soft caseous nodules, the skin over which was ulcerated. The scapular glands were enlarged caseous and softened, the axillary contained caseous foci. The lungs contained half-a-dozen grey tubercles, the kidneys four grey tubercles, the largest having a caseous centre. There was no tuberculosis elsewhere. The cause of death was not apparent.
"	"	826 days 15th generation, 20 days old	**1·0 mg.**	April 10, 1908.	**1729**	900	700	Died 72 days.	There was a softening caseous tumour at the seat of inoculation, the size of a hen's egg, the skin over which was thinned, and ulcerated in several places. The adjacent glands contained caseous gritty patches. The lungs showed a few minute transparent and caseating tubercles. The bronchial and portal glands contained caseous gritty patches. The kidneys showed minute pits on the surface and in one a single tubercle also. Death from causes other than tuberculosis.
"	"	"	**0·1 mg.**	"	**1727**	930	760	Died 153 days.	There was an ulcerated softening caseous tumour at the seat of inoculation. The adjacent glands were enlarged and filled with soft caseous substance. The lungs showed on the surface and in the margins scattered encapsuled nodules containing soft caseous gritty substance. There was a collection of flattened softening caseous growths, within fibrous capsules, on the dorsal surface of the pleural cavity. In the spleen there was a single caseous gritty nodule. The kidneys showed on the surface scattered depressed caseous tubercles. One popliteal gland was enlarged and caseous, other lymphatic glands were normal.

RABBITS INOCULATED WITH CULTURES OF VIRUS E. IV. GROWN FROM SINGLE COLONIES.

Virus.	Source of Culture.	Total Age of Culture: Age and Generation of Sub-culture.	No. of Colony.	Date.	No. of Rabbit.	Weight.		Duration of Life.	Result.
						Initial.	Final.		
E. IV.	Sternal gland of Guinea-pig 3124.	80 days 4th generation, 22 days old	I.	June 25, 1908.	**1803**	1,100	900	Died 7 days	Psorospermosis

"	"	"	"	"	1804	1,250	2,070	Killed 134 days.	Chronic general tuberculosis, not severe. There was a softening caseous local tumour and the right scapular gland was enlarged and caseous. There were four marginal caseating nodules and sparsely scattered caseating tubercles in the lungs; each kidney contained two or three minute caseating tubercles. The tissues around each wrist joint were swollen and infiltrated with softening caseous substance. There was no tuberculosis elsewhere.
"	"	"	II.	"	1805	1,650	2,900	Killed 134 days.	Slight tuberculosis. There was an ulcerated and discharging local tumour the size of a pigeon's egg, and the left scapular gland contained caseous patches; the right was a cyst containing clear fluid and a muco-caseous substance. In each caudal margin of the lungs there was a smooth nodule filled with soft caseous gritty substance; in the rest of the lungs there were a few small marginal nodules and scattered grey tubercles with caseo-calcareous centres. There were scattered small pits on the surfaces of the kidneys and each contained a caseous tubercle.
"	"	"	"	"	1806	1,320	2,600	Killed 134 days.	Slight tuberculosis. There were two small caseous nodules at the seat of inoculation; both scapular glands were cysts filled with clear fluid and caseous curds. The lungs showed fairly numerous smooth grey nodules with softening caseous centres in the margins, and an occasional translucent focus on the surface. The surfaces of the kidneys showed depressed scarred patches and two or three grey tubercles. The thoracic glands contained caseo-purulent substance.
"	"	"	III.	"	1807	1,240	1,470	Died 88 days	Slight tuberculosis. There was a lobulated softening caseous local tumour, ulcerated on the surface and extending deeply beneath the scapulae. The scapular glands were enlarged, softened and caseous. The lungs showed a few scattered grey tubercles with caseous centres. There was no tuberculosis elsewhere.
"	"	"	"	"	1808	1,440	1,070	Died 190 days.	Chronic general tuberculosis irregular in type. There was a softening caseous slightly ulcerated local tumour. The adjacent glands contained soft caseous nodules. The lung was congested and oedematous, the parenchyma was beset with minute translucent tubercles, and there were a few small caseous nodules in the margins. The cortices of the kidneys were closely beset with ill-defined grey foci, and tubercles with caseous centres. There was one minute focus in the spleen. Both wrist joints were a little swollen and the synovial membrane showed caseous foci. There was a caseous tubercle in a bronchial gland and caseous foci in the iliac glands.
"	"	"	IV.	"	1809	1,100	2,450	Killed 134 days.	Slight tuberculosis. There was a small ulcerated, softening, caseous mass at the seat of inoculation; both scapular glands were greatly distended, and consisted of bags filled with fluid and caseous flakes. There were half-a-dozen tubercles in the lungs. No tuberculosis elsewhere.
"	"	"	"	"	1810	1,370	2,020	Killed 134 days.	Slight chronic general tuberculosis. There was a scar at the seat of inoculation, and the adjacent scapular gland contained clear fluid and curdy caseous nodules. Each caudal extremity of the lungs contained a caseous nodule; elsewhere in the lungs a few minute caseating tubercles were seen. In the omentum there was a moderate number of caseous submiliary tubercles. The right kidney showed three pea-sized projecting fibro-caseous nodules, in the left there were two grey tubercles and the pelvis was distended with caseo-pus. The left wrist joint showed two soft caseous nodules on its anterior aspect.
"	"	"	V.	"	1811	1,100	2,350	Killed 135 days.	Slight tuberculosis. At the seat of inoculation there was a small ulcer, and a group of soft caseous nodules in the subcutaneous tissues. The adjacent glands were cystic and filled with clear fluid or caseo-pus. The lungs showed scattered grey nodules in some of which were opaque softening foci. Each kidney contained two or three minute caseating tubercles. There was no tuberculosis elsewhere.

RABBITS INOCULATED WITH CULTURES OF VIRUS E. IV. GROWN FROM SINGLE COLONIES—*continued.*

Virus.	Source of Culture.	Total Age of Culture: Age and Generation of Sub-culture.	No. of Colony.	Date.	Number of Rabbit.	Weight.		Duration of Life.	Result.
						Initial.	Final.		
E. IV.	Sternal gland of Guinea-pig 3124.	80 days 4th generation, 22 days old	**V.**	June 25, 1908.	**1812**	870	1,040	Killed 135 days.	Chronic general tuberculosis, not severe. There was a large nodular caseous local tumour, over which the skin was ulcerated. The adjacent glands were caseous. The lungs contained a few irregular caseous nodules. The kidneys showed on the surface, in all, eight grey nodules with caseous centres, up to a hemp seed in size, the largest extending as a wedge into the cortex. There were three minute yellow gritty tubercles in the spleen, fairly numerous caseous nodules in the walls of the large intestine, and a caseous nodule in each of two ventral mediastinal glands.
"	"	"	**VI.**	"	**1813**	1,090	1,520	Killed 135 days.	Slight tuberculosis. There was a caseous local tumour adherent to the skin, which was ulcerated. The scapular glands were enlarged, partly cystic and filled with softening caseous gritty substance. The left axillary gland contained caseo-calcareous tubercles. The lungs showed at the caudal extremities and in the margins scattered smooth grey nodules beset with caseous foci. Each kidney showed in the cortex a few grey nodules with caseous centres, the largest of which extended into the medulla as caseous streaks. There was no tuberculosis elsewhere.
"	"	"	"	"	**1814**	1,920	1,360	Died 96 days.	Chronic general tuberculosis. There was a baggy cyst filled with caseo-pus at the seat of inoculation, and a small caseous nodule in the adjacent scapular gland. The lungs were congested and oedematous and showed on the surface fairly numerous minute irregular caseating tubercles, and several caseous patches on the dorsal surfaces and in the margins. The cortices of the kidneys contained moderately numerous caseating nodules up to a hemp seed in size. The synovial membranes of both knee joints were enlarged and beset with caseous foci.
"	"	"	**VII.**	"	**1815**	1,330	3,180	Killed 135 days.	Slight tuberculosis. There was a flat grey local tumour beset with soft yellow foci. The scapular and right axillary glands were enlarged and consisted of a sponge-work of grey tissue, of which the interstices were filled with yellowish pus. There were three grey tubercles in one kidney, and a single grey nodule in one lung.
"	"	"	"	"	**1816**	810	1,000	Died 59 days.	Early tuberculosis. Death premature, probably from sepsis. The tumour at the seat of inoculation between the scapulae was irregular and nodular composed of softening caseous substance; extending from it down over the right chest there was a baggy cyst filled with foul smelling fluid. The adjacent glands were partly caseous or contained caseous foci. There were a few minute greyish tubercles in the liver, spleen and kidneys; the lungs contained a few grey tubercles with caseous centres, up to a rape seed in size.
"	"	"	**VIII.**	"	**1817**	940	1,500	Killed 135 days.	Chronic tuberculosis, rather severe in the lungs. There was a caseous ulcerated local tumour, the size of a pigeon's egg. The left scapular gland was enlarged, caseous and adherent to the skin which was ulcerated; other glands adjacent to the tumour contained soft caseous nodules. Almost the whole of the margins of the lungs was replaced by nodules, containing softening caseous substance some of which showed commencing cavity formation; more than half the anterior lobes were replaced by similar nodules, and there were numerous caseous nodules scattered about in the rest of the lungs. Each kidney showed on the surface a number of small pits and scattered submiliary caseous tubercles.

„	„	„	„	„	1818	1,240	960	Died 96 days.	Slight general tuberculosis. The cause of death was not apparent. There was a large ulcerated caseo-necrotic local tumour. The adjacent glands contained softening caseous nodules which easily shelled out. The lungs showed a moderate number of minute grey tubercles and an occasional miliary caseating tubercle. One mediastinal gland was partly caseous. In the cortices of the kidneys there were scattered grey nodules with caseous centres, ranging up to a pea in size.

GUINEA-PIGS INOCULATED WITH CULTURES FROM VIRUS E. IV.

(*a*) Intraperitoneal.

Virus.	Source of Culture.	Total Age of Culture: Age and Generation of Subculture.	Dose.	Date.	Number of Guinea-pig.	Weight in grms.		Duration of Life.	Result.
						Initial.	Final.		
E. IV.	Original material through a guinea-pig.	115 days 6th generation, 21 days old	0·1 mg.	April 30, 1906.	1980	510	270	Died 30 days.	General tuberculosis.
„	„	390 days 18th generation, 21 days old	1·0 mg.	Jan. 30, 1907.	2348	320	240	Died 14 days.	Acute tuberculosis.
„	„	„	1·0 mg.	„	2349	370	250	Died 8 days.	Acute tuberculosis.
„	„	„	1·0 mg.	„	2350	350	250	Died 9 days.	Acute tuberculosis.
„	„	„	1·0 mg.	„	2351	350	250	Died 11 days.	Acute tuberculosis.
„	„	„	1·0 mg.	„	2352	350	220	Died 17 days.	Acute tuberculosis.
„	„	„	1·0 mg.	„	2353	270	200	Died 6 days.	Acute tuberculosis.

(*b*) Subcutaneous.

Virus.	Source of Culture.	Total Age of Culture: Age and Generation of Subculture.	Dose.	Date.	Number of Guinea-pig.	Initial.	Final.	Duration of Life.	Result.
E. IV.	Original material through a guinea-pig.	115 days 6th generation, 21 days old	0·1 mg.	April 30, 1906.	1979	520	280	Died 62 days.	General tuberculosis.
„	„	320 days 15th generation, 21 days old	1·0 mg.	Nov. 20, 1906.	2212	370	400	Died 97 days.	General tuberculosis.
„	„	„	0·1 mg.	„	2211	470	350	Died 60 days.	General tuberculosis.
„	„	495 days 23rd generation, 20 days old	1·0 mg.	May 15, 1907.	2487	650	500	Died 144 days.	General tuberculosis of a chronic fibroid type.
„	„		0·1 mg.	„	2488	970	420	Died 167 days.	Very chronic tuberculosis; there was but little change in the lymphatic glands.

(*c*) Cutaneous.

Virus.	Source of Culture.	Total Age of Culture: Age and Generation of Subculture.	Dose.	Date.	Number of Guinea-pig.	Initial.	Final.	Duration of Life.	Result.
E. IV.	Original material through a guinea-pig.	15th generation, 12 days old	—	April 2, 1908.	3140	740	530	Died 88 days.	General tuberculosis.

RABBITS INOCULATED WITH CULTURES DERIVED FROM VIRUS E. V.

(*a*) Intravenous Inoculations.

Virus.	Source of Culture.	Total Age of Culture; Age and Generation of Subculture.	Dose.	Date.	Number of Rabbit.	Weight.		Duration of Life.	Result.
						Initial.	Final.		
E. V.	Equine lung, direct	116 days, 5th generation, 21 days old.	1·0 mg.	September 9, 1907	1444	1,590	1,100	Died, 16 days	General tuberculosis.
,,	,,	,,	0·1 mg.	,,	1446	1,330	1,090	Died, 18 days	General tuberculosis.

(*b*) Subcutaneous Inoculations.

E. V.	Equine lung, direct	116 days, 5th generation, 21 days old.	10·0 mg.	September 9, 1907	1445	1,750	1,200	Died, 34 days	Acute tuberculosis.
,,	,,	,,	10·0 mg.	,,	1443	1,720	1,230	Died, 45 days	General tuberculosis.
,,	,,	,,	1·0 mg.	,,	1442	1,510	1,220	Died, 53 days	General tuberculosis.

GUINEA-PIGS INOCULATED WITH CULTURE DERIVED FROM VIRUS E. V.

Virus.	Source of Culture.	Total Age of Culture; Generation of Subculture.	Dose.	Date.	Number of Guinea-pig.	Mode of Inoculation.	Weight in Grammes.		Duration of Life.	Result.
							Initial.	Final.		
E. V.	Equine lung, direct	116 days, 5th generation, 21 days old.	0·1 mg.	September 9, 1907	2610	Intrap.	370	250	Died, 18 days	Acute general tuberculosis.
,,	,,	,,	0·1 mg.	,,	2609	Subcut.	430	300	Died, 75 days	General tuberculosis.

VIRUS E. I.

CULTURE INOCULATIONS

I.—June 27, 1906.

The strain was derived from the original material through a guinea-pig, and had been 188 days in artificial cultivation.

The culture used was the 9th generation, 21 days old

CALF 436.

Subcutaneous

Dose : 50·0 mg.

Died : July 13, 1906.

16 days.

P.M. — Death was due to diarrhœa. There was a caseous local lesion, and the adjacent glands were caseous. Moderately numerous minute grey foci were seen in lungs and liver ; there were a few in the kidneys. Two mesenteric glands contained each an opaque focus.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
927	Intrav.	1·0 mg.	D. 12 days	G. T.
930	Intrap.	1·0 mg.	D. 19 ,,	G. T.
931	Intrap.	1·0 mg.	D. 19 ,,	G. T.
933	Subcut.	1·0 mg.	D. 73 ,,	G. T.
934	Subcut.	0·1 mg.	D. 75 ,,	G. T.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2110	Intrap.	1·0 mg.	D. 13 days	Acute T.
2109	Subcut.	1·0 mg.	D. 42 ,,	G. T.
2111	Subcut.	0·1 mg.	D. 56 ,,	G. T.

VIRUS E. I.—*continued.*

CULTURE INOCULATIONS—*continued.*

II.—APRIL 17, 1907.

The strain was derived from the original material through a guinea-pig, and had been 482 days in artificial cultivation.

The culture used was the 18th generation, 21 days old.

CALF 522.
Subcutaneous.
Dose : 50·0 mg.
Died : May 23, 1907.
36 days.
P.M.—General tuberculosis.

CALF 528.
Subcutaneous.
Dose : 50·0 mg.
Died : May 17, 1907.
30 days.
P.M.—General tuberculosis.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1310	Intrav.	1·0 mg.	D. 16 days	G. T.
1309	Intrav.	0·1 mg.	D. 19 „	G. T.
1311	Intrap.	1·0 mg.	D. 32 „	G. T.
1314	Subcut.	10·0 mg.	D. 50 „	G. T.
1312	Subcut.	1·0 mg.	D. 83 „	G. T.
1313	Subcut.	1·0 mg.	D. 139 „	Chronic G. T.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2424	Subcut.	1·0 mg.	D. 42 days	G. T.
2423	Subcut.	0·1 mg.	D. 50 „	G. T.

VIRUS E. I.—*continued.*

CULTURE INOCULATIONS—*continued.*

III.—June 20, 1907.

The strain was derived from the original material through a guinea-pig, and had been 545 days in artificial cultivation.

The culture used was the 20th generation, 21 days old.

PIG 192.
Subcutaneous.
Dose : 10·0 mg.
Died : August 7, 1907.
48 days.
P.M.—General tuberculosis.

IV.—February 11, 1908.

The strain was derived from the original material through a guinea-pig, and had been 782 days in artificial cultivation.

The culture used was the 26th generation, 22 days old.

PONY 16.
Intravenous.
Dose : 10·0 mg.
Died : February 28, 1908.
17 days.

P.M.—The lungs were congested and oedematous, and showed a diffuse grey infiltration which in places could be resolved into collections of just visible foci. There was no macroscopic tuberculosis elsewhere ; moderately numerous T.B. were seen in a smear from the spleen.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1639	Intrav.	0·1 mg.	D. 24 days	Acute T.
1638	Intrav.	0·01 mg.	D. 32 „	G. T.
1640	Subcut.	10·0 mg.	D. 120 „	Chronic severe G. T.
1641	Subcut.	10·0 mg.	D. 64 „	T., moderately severe in lungs only.

CALF 436. Virus E. I.

Subcutaneous inoculation of culture derived from the original material through a guinea-pig.

Dose—50 milligrammes.

Date of Inoculation—June 27, 1906. [Age about 7 weeks.]

Died—July 13, 1906. [16 days after inoculation.] [Death occurred prematurely from diarrhœa.]

Temperature.

Temperature rose to 39·7° on the 8th day and remained about 39·4° until death

Weights

	Kilos.
June 27, 1906	29·02
July 13, 1906	29·47

Gain in weight.—0·45 kilos.

POST-MORTEM EXAMINATION.

General condition fair

Local Lesion.—On the left side of the neck there was a lenticular-shaped tumour measuring 7·5 by 2 cm. On section it consisted of caseous tissue surrounding a central cavity containing fluid and flakes of caseous substance.

The skin and muscles were infiltrated.

Left Prescapular Gland.—The left prescapular gland measured 6·3 by 3·7 cm. On section about half the cortex consisted of firm grey tissue with a caseous network; in the rest of the gland there were small early caseous tubercles.

Right Prescapular Gland.—Normal.

Prepectoral Glands.—The left round prepectoral gland was slightly enlarged and caseous throughout

The left reniform prepectoral gland appeared normal, except for slight oedema.

The right prepectoral glands appeared normal.

Cervical Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—The lungs were mottled by patches of collapse. Scattered throughout the substance there were moderately numerous foci, the smallest of which, that is the majority, were grey and translucent; some about 5 mm. had minute opacities in the centre.

Mediastinal and Bronchial Glands.—Normal.

Heart and Pericardium.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Intestines.—Normal.

Mesenteric Glands.—Each of two contained a minute opaque focus.

Spleen.—The spleen appeared normal; the Malpighian bodies were not prominent.

Liver.—Scattered throughout the liver there were moderately numerous minute grey foci.

Portal Glands.—Normal.

Kidneys.—In the cortices of the kidneys there were sparsely scattered minute grey foci.

Suprarenal Bodies.—Normal.

Renal, Coeliac, Lumbar, and Iliac Glands.—Normal.

Tongue, Tonsils, Larynx, Pharynx, and Trachea.—Normal.

Various Lymphatic Glands.

Parotid, Submaxillary, Retro-pharyngeal, Axillary, Precrural, Popliteal, Gluteal, and Ischiatic Glands.—All appeared normal.

CALF 528. Virus E. I.

Subcutaneous inoculation with culture derived from the original material through a guinea-pig

Dose—50 milligrammes.

Date of Inoculation—April 17, 1907. [Age 11 weeks.]

Died—May 17, 1907. [30 days after inoculation.]

Temperature.

The temperature rose from 38·2° to 39·7° on the 3rd day after inoculation. It remained above 39° until 14 days after inoculation, when it rose to 40·3°. It subsequently fluctuated and fell to 39·7° at which it remained for a week before death.

Weights.

	Kilos.
April 17, 1907	39·45
May 17, 1907	36·73

Total loss of weight.—2·72 kilos.

POST-MORTEM EXAMINATION.

General condition poor.

Local Lesion.—At the seat of inoculation in the subcutaneous tissues on the left side of the neck there was a firm tumour measuring 11 by 9 by 4 cm. and weighing 226 grammes. It was rounded externally and on section was composed of pinkish yellow caseous necrotic substance infiltrating both the skin and muscles. In the centre of the tumour were some small spaces filled with serous fluid.

Prescapular Glands.—The left prescapular gland measured 8 by 5 by 4 cm. and weighed 56 grammes. On section it was composed practically throughout of dense yellow caseated tissue.

The right prescapular gland was deeply congested and oedematous, and showed a number of early caseous tubercles irregular in outline.

Prepectoral Glands.—The left prepectoral glands were only slightly enlarged, but deeply congested. The rounded gland showed early tuberculous infiltration in the cortex; the reniform prepectoral gland contained a few discrete greyish yellow tubercles.

The right prepectoral glands showed a few irregular discrete caseous tubercles.

The Cervical, Submaxillary, Parotid, Retro-pharyngeal, and Axillary Glands each showed a moderate number of discrete irregular tubercles, with slight caseation, ranging in size from 0·5 mm. up to 2 mm. in diameter, resembling those in the right prescapular gland.

Thorax.

Pleura.—Along the margins of the ribs were small clusters of minute grey tubercles surrounded by vascular connective tissue; there were also two flattened greyish red nodules.

There were several flattened caseating nodules on the pleura covering the pericardium. Similar nodules (about 12 in number) were seen on the pleura covering the diaphragm around the central tendon.

Lungs.—The right cephalic lobe, right middle and ventral portions of the right caudal lobe, were dark red and quite airless. The left cephalic lobe was partly consolidated. The remainder of the lung showed small patches of hepatisation; the parenchyma was closely and evenly beset with grey miliary tubercles with opaque centres.

Thoracic Lymphatic Glands.—The mediastinal and the left bronchial glands were moderately enlarged and showed their cortices composed of reddish grey tissue, infiltrated with yellow caseous foci and patches (in places forming a network).

The right bronchial and the infra-tracheal glands were deeply congested and closely beset with caseous miliary tubercles. A gland just within the entrance to the thorax on the left side was enlarged and resembled the mediastinal glands. The corresponding gland on the right side contained discrete tubercles.

Heart.—In the heart muscle half-a-dozen tubercles were seen; five of these were yellow and caseous, the sixth was grey and not obviously caseous.

Abdomen.

Omentum.—The omentum showed on the ventral surface scattered tubercles ranging up to 2 mm. in diameter; some were deeply congested, others had a pinkish grey colour; none showed definite caseation.

Peritoneum.—Normal.

Intestines.—In the long Peyer's patch of the small intestine there were fairly numerous submucous caseating tubercles. There were similar, but much more sparsely scattered tubercles in the rest of the intestine.

The lymphoid follicles in the large intestine were enlarged but not caseous.

Mesenteric Glands.—These glands were not enlarged; they were beset with tubercles (the majority being minute) in a state of early caseation; they were most numerous in the middle mesenteric glands which, under the capsules, had a speckled appearance. In the terminal glands they were more sparsely distributed and were also generally larger.

Ileo-Colic and Colic Glands.—These resembled the terminal mesenteric glands.

Spleen.—The spleen weighed 198 grammes. On section the pulp had a coarsely granular appearance, and was very closely beset with greyish red tubercles with yellow caseous centres.

Liver.—The liver was evenly and closely beset with grey tubercles varying in size from a mere point up to rather more than one millimetre in diameter; the larger were distinctly yellow and caseous in the centre.

Gall Bladder.—In the mucous membrane of the gall bladder there were fairly numerous miliary caseous tubercles.

Portal Glands.—The portal glands were slightly enlarged and showed in the cortices grey patches and separate nodules infiltrated with either yellow caseous foci or an irregular network.

Kidneys.—The kidneys showed in their cortices moderately numerous grey tubercles varying up to 1·5 mm. in diameter, some of which were slightly opaque and yellow in the centre.

Suprarenal Bodies.—In the cortex of each were several grey miliary tubercles.

The urinary bladder showed three or four early caseous tubercles the size of rape seeds.

The Coeliac Glands resembled the portal glands.

The Pudic, Popliteal, Gluteal, Ischiatic and Precrural Glands were deeply congested, and showed a moderate number of discrete, irregular, caseating tubercles.

The upper part of larynx, pharynx and tongue appeared normal. In the lower part of larynx there were a few slightly raised, flat congested tubercles; they were moderately numerous along the whole length of trachea; they were congested and the majority had minute pits in the centre.

Microscopical Examinations.

(Smear preparations.)

Prescapular Gland.—Very numerous tubercle bacilli.

Heart (tubercle), *Tonsil* (focus), *Small Intestine* (caseous nodule) and *Large Intestine* (follicle).—A few tubercle bacilli in each case.

PIG 192. Virus E. I.

Subcutaneous inoculation of culture derived from the original material through a guinea-pig.

Dose—10·0 milligrammes.

Date of Inoculation—June 20th, 1907. [Age 14 weeks.]

Died—August 7, 1907. [48 days after inoculation.]

Temperature.

The temperature rose gradually from 38·5° until it reached 40·6° on the 30th day after inoculation. For a fortnight it remained above 40°, the maximum being 40·6°, until two days before death, when it fell suddenly.

Weights.

	Kilos.
June 21, 1907	24·03
August 7, 1907...	20·40

Loss of weight.—3·63 kilos.

POST-MORTEM EXAMINATION.

Condition fair.

Local Lesion.—To the left of the mid-line of the abdomen there was a cyst measuring 5 by 4 cm., the skin over which was reddened but not thinned or ulcerated; it was composed of a thick fibrous capsule filled with serous fluid containing curdy caseous masses. The internal wall of the cyst was roughened by adherent caseous substance.

The muscles beneath the tumour were adherent and infiltrated with caseous substance.

Inguinal Glands.—The left inguinal glands formed a mass measuring 6 by 5 by 4·3 cm., which, on section was caseous throughout with central softening.

The right inguinal glands measured 4·5 by 2·5 by 1·0 cm. On section they showed a moderate number of yellow caseous nodules the size of millet seeds.

Precrural Glands—The precrural glands showed, nodules similar to those in the right inguinal glands, but rather larger.

The Iliac, Lumbar, and Renal Glands showed caseous nodules with grey margins.

Thorax.

Pleura.—The lymphatic fringes along the margins of the ribs were deeply congested and filled with clusters of minute translucent tubercles.

The diaphragm showed a moderate number of flattened translucent nodules about 2 mm. in diameter.

Lungs.—The lungs did not collapse on opening the chest-wall and filled the pleural cavities. The substance was closely beset with confluent translucent nodules with central caseation forming a close network leaving small islands of congested lung tissue. Many of these nodules projected slightly on the pleural surfaces and had attached to them loose fibrinous fringes.

Bronchial Glands.—The bronchial glands were enlarged and showed numerous irregular caseating nodules with fine opaque yellow lines in the centre.

Mediastinal Glands.—The left ventral mediastinal gland, the size of a walnut, was almost entirely composed of soft yellowish caseo-pus.

Tongue, Tonsils, Larynx, Pharynx, and Trachea.—Normal.

The thyroid body showed a few small caseous tubercles.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—The spleen was nodular on the surface and was closely filled with grey nodules with caseous centres ranging in size from a mere point up to 5 mm.

Liver.—The liver showed numerous grey tubercles with caseous centres from a point up to a rape seed in size.

Portal Glands.—The portal glands were practically replaced by a coarse network of caseated tissue.

Kidneys.—Each kidney showed one or two grey tubercles, the size of rape seed, with caseous centres.

Suprarenal Bodies.—The suprarenal bodies showed in their cortices one or two small grey tubercles.

Intestines.—Normal.

Mesenteric Glands.—All the mesenteric glands showed small yellow caseous nodules chiefly about 1 mm. in diameter; in some glands these were discrete, in others they formed a coarse network.

The colic glands showed similar nodules.

Submaxillary, Pharyngeal, Cervical and Prescapular Lymphatic Glands.—Each showed a moderate number of yellowish caseous nodules up to a hemp seed in size, but the majority about the size of rape seed.

Each ovary showed several opaque whitish foci.

Microscopical Examinations.

(Smear preparations.)

Emulsion of Left Inguinal Gland showed numerous tubercle bacilli.

Diaphragm (nodule) *Ovary* (focus) ...	No tubercle bacilli seen.

PONY 16. Virus E. I.

Intravenous inoculation with culture derived from the original material through a guinea-pig.

Dose—10 milligrammes.

Date of Inoculation—February 11, 1908. [Age—Yearling.]

Died—February 28, 1908. [17 days after inoculation.]

Clinical History.

The animal quickly became very ill with great respiratory distress.

Temperature.

During the first eleven days after the inoculation the temperature was very irregular, ranging from 37·8 to 39·7; on the thirteenth day 40·1 was recorded; the subsequent daily temperatures were 40·2° C., 39·5° C., and 40·4° C.; on the 17th day the pony was dead.

Weights.

	Kilos.
February 11, 1908	87·52
February 28, 1908	61·22

Loss in weight.—26·30 kilos.

POST-MORTEM EXAMINATION.

Carcass thin and emaciated.

Thorax.

Lungs.—The lungs were voluminous and felt firm. On section they were congested and oedematous and a close inspection revealed a diffuse infiltration of grey tissue which in places could be resolved into collections of translucent foci just visible.

Abdomen.

Intestines.—Normal.

Mesenteric Glands.—Normal.

Spleen.—The spleen weighed 254 grammes; on section the pulp appeared normal.

Liver.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Many of the lymphatic glands were congested and almost all were oedematous, but none showed any sign of caseation.

Microscopical Examinations.

(Smear preparations.)

Lung.—Numerous tubercle bacilli.

Spleen.—Moderately numerous tubercle bacilli.

Liver.—No tubercle bacilli.

Kidney.—Two tubercle bacilli.

Mesenteric Gland.—No tubercle bacilli.

Intestine.—No tubercle bacilli.

CALF 522. Virus E. I.

Subcutaneous inoculation with culture derived from the original material (through a guinea-pig).

Dose—50 milligrammes.

Date of Inoculation—April 17, 1907. [Age 8 weeks.]

Died—May 23, 1907. [36 days after inoculation.]

Temperature.

The temperature rose to 40° C. on the sixth day after inoculation. Subsequently it fluctuated, but remained high, maximum 40·4°, for a fortnight, after which it fell to 39·2°. It quickly rose to 40° C. and remained a few days above and then slowly fell until death.

Weights.

	kilos.
April 17, 1907	42·62
May 23, 1907	38·54

Total loss in weight.—4·08 kilos.

POST-MORTEM EXAMINATION.

General condition poor.

Local Lesion.—In the subcutaneous tissues on the left side of the neck there was a slightly prominent tumour, measuring 14 by 9 by 5 cm. and weighing 481 grammes. The skin over it was adherent and just beginning to break down, showing a small crack from which a little blood-stained fluid was escaping. On section the tumour was composed of dense pinkish-yellow necrotic tissue, which infiltrated both skin and muscle. It had a small irregular cavity in the centre.

Prescapular Glands.—The left prescapular gland measured 11 by 6 by 4·5 cm. and weighed 169 grammes. On section it was composed practically throughout of dense pinkish-yellow caseous necrotic tissue. The capsule of the gland was thickened.

The tissues around the local tumour and the left prescapular gland were greatly thickened and oedematous.

The right prescapular gland measured 6 by 2·5 by 1 cm. and showed moderately numerous caseous nodules 2 to 3 mm. in diameter.

Prepectoral Glands.—The left rounded prepectoral gland measured 2 by 1·5 cm. and was composed of translucent tissue with a fine caseous network. The left reniform prepectoral gland showed a few discrete yellow caseous tubercles.

The prepectoral glands on the right side showed a few discrete caseous tubercles irregular in outline.

Cervical Glands.—The left inferior cervical gland measured 4·5 by 3 by 1·5 cm. On section it showed the greater part of the gland substance replaced by a fine yellowish caseous network. At one extremity of the gland there were two or three discrete caseous nodules 2 mm. in diameter.

The other cervical glands on the left side showed a moderate number of discrete irregular yellowish caseous nodules.

The right inferior cervical gland showed a few discrete caseous tubercles irregular in outline. The other cervical glands on the right side contained a few discrete caseous tubercles, the largest 2 mm. in diameter.

Thorax.

The lymphatic fringes along the margins of the ribs were deeply congested and showed thick clusters of minute pearly grey tubercles with an occasional flattened nodule up to 4 mm. in diameter ; these latter contained caseous centres.

Diaphragm.—The peritoneal surface of the diaphragm showed a few small tubercles with opaque centres. On the pleural surface there were some clusters of small grey tubercles similar to those seen on the ribs.

Lungs.—The lungs were very heavy. The right middle, right cephalic, left cephalic and ventral portions of the caudal lobes were congested ; there was a small patch of congestion at the base of the left caudal lobe. The lung parenchyma was closely and evenly beset with grey tubercles with caseous centres, varying from a mere point up to 2 mm. in diameter ; in places these tubercles had run together to form larger nodules. The lung tissue of the anterior lobes and ventral portions of the posterior lobes between the nodules was reddish grey and solid, leaving only small patches of crepitant lung. The dorsal parts of the posterior lobes contained much more crepitant lung tissue and the nodules were less closely placed.

Thoracic Lymphatic Glands.—The mediastinal glands were enlarged and showed in their cortices masses of greyish yellow caseous network, practically replacing the cortices.

The bronchial glands closely resembled the mediastinal glands. A gland at the entrance to the thorax and the ventral mediastinal glands showed irregular yellowish caseous nodules.

Heart.—In the muscle of the heart there was an opaque greyish nodule 2 mm. in diameter. The heart was otherwise normal.

Abdomen.

Peritoneum.—Normal.

Omentum.—On the ventral surface of the omentum there were numerous congested nodules, ranging in size from a speck up to 3 mm. in diameter. The majority of these nodules had caseous centres.

Intestines.—Scattered throughout the whole length of the small intestine, beneath the mucous membrane, were fairly numerous small yellow caseous tubercles. The large intestine appeared normal.

Gastric Glands.—The gastric glands showed in their cortices small caseous tubercles, some discrete, others forming a network.

Mesenteric Glands.—All the mesenteric glands were beset with numerous irregular caseous nodules surrounded by a margin of grey tissue, some discrete, some forming a caseous network.

Colic Glands.—The colic glands showed small discrete caseous tubercles.

Spleen.—The spleen weighed 481 grammes. It was swollen. The surface was normal. On section it was closely packed with grey nodules with caseous centres up to 3 mm. in diameter.

Liver.—The liver contains numerous grey nodules with caseous centres varying from ·5 up to 2·5 mm. in diameter : there was also a number of grey foci. Some of the tubercles projected above the surface. They were evenly distributed throughout the substance but in slightly fewer numbers than just beneath the capsule.

Portal Glands.—The portal glands were enlarged and showed their cortices closely beset with a yellowish grey caseous network.

The gall bladder showed about 18 small yellow caseous tubercles, over two of which there was ulceration of the mucous membrane.

Kidneys.—Each kidney contained in the cortex a moderate number of grey tubercles, ranging in size from a mere point up to 3 mm. in diameter, the larger ones being caseous in the centre. On section similar tubercles were seen in the depth of the cortex.

Suprarenal Bodies.—Each suprarenal body showed a few yellowish grey caseous tubercles.

Urinary Bladder.—Normal.

Coeliac Glands.—Of the coeliac glands, one showed about one half of its cortex replaced by yellow caseous tissue. The others each showed a moderate number of yellow caseous nodules forming a coarse network.

The Iliac, Lumbar, and Renal Glands contained a moderate number of discrete yellowish caseous nodules up to 5 mm. in diameter.

The Popliteal, Gluteal, Pudic, Precrural and Ischiatic Glands showed discrete caseous nodules from 2 to 4 mm. in diameter.

Axillary Glands.—Each showed in the cortex yellow caseous nodules 3 mm. in diameter.

Tonsils.—In each tonsil there was a moderate number of opaque foci.

Along the trachea was a moderate number of flat grey congested tubercles with opaque centres.

The larynx showed two similar tubercles and the epiglottis one.

In the oesophagus were a few small yellow caseous tubercles.

Tongue.—Normal.

The submaxillary, retro-pharyngeal, and parotid glands contained a moderate number of discrete yellow caseous nodules, 3 to 4 mm. in diameter.

Microscopical Examinations.

(Smear preparations.)

Suprarenal Body (tubercle). — Showed fairly numerous tubercle bacilli.

Heart (nodule).—Showed fairly numerous tubercle bacilli.

Tonsil (focus).—Showed fairly numerous tubercle bacilli.

VIRUS E. II.

CULTURE INOCULATIONS.

I.—April 30, 1906.

The strain was derived from the original material through a guinea-pig, and had been 130 days in artificial cultivation.

The culture used was the 7th generation, 21 days old.

CALF 404.

Subcutaneous.
Dose : 10·0 mg.
Killed : July 28, 1906.
89 days.

P.M. — Small fibrous-walled cyst containing caseo-pus at seat of inoculation ; a caseous patch and numerous soft yellow gritty tubercles in left prescapular gland. Small scattered yellowish foci in thoracic and one renal gland : one small fibrous - walled nodule with yellow centre in liver (no T.B.).

CALF 406.

Subcutaneous.
Dose : 10·0 mg.
Killed : July 30, 1906.
91 days.

P.M.—The local tumour was small, dense, and caseous, surrounded by a fibrous capsule and containing a small cavity filled with fluid and caseous flakes. The left prescapular gland was extensively caseated. In the lungs there were seven nodules up to a hemp seed in size with yellow centres and grey margins, and a few small grey tubercles. The terminal mesenteric and ileo-colic and several colic glands contained fairly numerous yellow gritty tubercles. One bronchial and one pharyngeal gland contained each a single tubercle.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
838	Intrav.	1·0 mg.	D. 24 days	G. T.
839	Intrav.	0·1 mg.	D. 22 ,,	G. T.
840	Intrap.	1·0 mg.	D. 29 ,,	G. T.
841	Intrap.	0·1 mg.	D. 43 ,,	G. T.
842	Subcut.	1·0 mg.	K. 111 ,,	Local T. and five tubercles in the lung.
843	Subcut.	0·1 mg.	K. 112 ,,	Local T. and one nodule in the lung.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
1978	Intrap.	0·1 mg.	D. 40 days	G. T.
1977	Subcut.	0·1 mg.	D. 66 ,,	G. T.

VIRUS E. II —*continued.*

CULTURE INOCULATIONS—*continued.*

II.—NOVEMBER 21, 1906.

The strain was derived from the original material through a guinea-pig, and had been 335 days in artificial cultivation.

The culture used was the 16th generation, 21 days old.

LEMUR 16.

Subcutaneous.
Dose : 1·0 mg.
Died : December 26, 1906.
35 days.
P.M.—Acute tuberculosis.

LEMUR 18.

Fed.
Dose : 1·0 mg.
Died : February 5, 1907.
76 days.

P.M.—General tuberculosis. The mesenteric glands were enormously enlarged and caseated, and there were small scattered ulcers in the intestines.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1083	Subcut.	10·0 mg.	K. 102 days	Local T. and slight T. of lungs and kidneys.
1082	Subcut.	1·0 mg.	K. 102 „ (paralysed).	Local T., very slight T. of lungs, one tubercle in one kidney. In the spinal cord there was a caseous nodule causing almost complete section.
1081	Subcut.	0·1 mg.	K. 102 „	Local T., slight T. of lungs, one tubercle in one kidney.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2214	Subcut.	1·0 mg.	D. 44 days	G. T.
2213	Subcut.	0·1 mg.	D. 77 „	G. T.

VIRUS E. II.—*continued.*

CULTURE INOCULATIONS—*continued.*

III.—JANUARY 30, 1907.

The strain was derived from the original material through a guinea-pig, and had been 405 days in artificial cultivation.

The culture used was the 19th generation, 21 days old.

CALF 504

Subcutaneous.

Dose : 50·0 mg.

Killed : May 10, 1907.

100 days.

P.M. — Fibrous-walled cyst at seat of inoculation. The left prescapular gland was three-parts occupied by caseo-necrotic masses beginning to break down in the centre. There were four or five tubercles in the lungs, one in one kidney, and a number of soft yellow nodules in the small intestine (T.B. seen). The thoracic and portal glands showed an occasional minute focus, the renal, mesenteric and ileo-colic glands scattered gritty tubercles.

CALF 506.

Subcutaneous.

Dose : 50·0 mg.

Killed : May 9, 1907.

99 days.

P.M. — Fibrous-walled cyst at seat of inoculation. The left prescapular gland contained two caseo-calcareous nodules and scattered tubercles ; one cervical gland was caseo-calcareous. The lungs contained two hard grey nodules, a collection of minute grey tubercles, and an occasional translucent focus. One bronchial gland and one portal gland contained one or more small foci.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1221	Intrav.	1·0 mg.	D. 34 days	G. T.
1222	Intrap.	1·0 mg.	D. 88 „	Slight G. T., and severe pseudo-T. of spleen.
1223	Subcut.	10·0 mg.	D. 37 „	Local lesion only; death from pleurisy.

VIRUS E. II.—*continued.*

CULTURE INOCULATIONS—*continued.*

IV.—MAY 15, 1907.

The strain was derived from the original material through a guinea-pig, and had been 510 days in artificial cultivation.

The culture used was the 25th generation, 21 days old.

PIG 186.

Subcutaneous.

Dose : 50·0 mg.

Killed when ill : November 5, 1907.

174 days.

P.M. — General tuberculosis, very severe in the lungs.

PIG 184.

Subcutaneous.

Dose : 10·0 mg.

Killed when well : February 7, 1908.

268 days.

P.M. — General tuberculosis, severe in the lungs.

RHESUS MONKEY 166.

Subcutaneous.

Dose : 1·0 mg.

Died : June 3, 1907.

19 days.

P.M. — Small local lesion only. One or two T.B. seen in smears from lung, liver, and spleen. The cause of death was not apparent.

RHESUS MONKEY 168.

Subcutaneous.

Dose : 10·0 mg.

Killed when very ill : July 5, 1907.

51 days.

P.M.—Ulcerated local lesion ; three axillary glands and one vertebral gland showed a few caseous nodules or opaque foci. In the lungs there were a few grey sub-miliary tubercles ; the Malpighian bodies of the spleen showed early caseation ; the liver contained moderately numerous minute grey tubercles. The portal and coeliac glands contained caseous miliary tubercles.

GUINEA-PIGS.

—	Number.	Method.	Duration of Life.	Result.
Emulsion of spleen.	2551	Subcut.	K. 203 days	Very chronic T. of moderate severity.
	2553	Subcut.	D. 122 „	G. T.
Emulsion of liver.	2552	Subcut.	K. 202 „	Very chronic severe G. T.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1331	Intrav.	0·1 mg.	D. 127 days	T. of lungs and kidneys.
1330	Subcut. and Intrap.	1·0 mg.	D. 265 „	Local T. T. of peritoneum, pleura, diaphragm, lungs (severe), and kidneys.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2485	Subcut.	1·0 mg.	D. 133 days	Chronic G. T.
2486	Subcut.	0·1 mg.	D. 212 „	Chronic G. T.

VIRUS E. II.—*continued.*

CULTURE INOCULATIONS—*continued.*

V.—September 17, 1907.

The strain was derived from the original material through a guinea-pig, and had been 635 days in artificial cultivation.

The culture used was the 7th generation, 22 days old.

RHESUS MONKEY 180.

Subcutaneous.
Dose: 1·0 mg.
Died: December 27, 1907.
101 days.

P.M.—Fibrous-walled cyst containing soft caseous tissue. One axillary gland was occupied by purulent nodules. The spleen contained fairly numerous purulent nodules up to a pea in size. Each kidney showed one caseous nodule; there was a nodule with a caseous centre in the abdominal wall. No tuberculosis elsewhere.

RHESUS MONKEY 184.

Subcutaneous.
Dose: 0·1 mg.
Died: December 24, 1907.
98 days.

P.M.—The local lesion was composed of caseated tissue with a cavity containing caseo-pus; the left axillary glands contained caseous nodules. There was a moderate number of small grey tubercles in the lungs and liver, and a few in the kidneys; the spleen was closely filled with caseous tubercles. The large intestine showed four caseous nodules and minute caseous points in the follicles. Most of the lymphatic glands showed varying degrees of caseation.

RHESUS MONKEY 186.

Fed.
Dose: 1·0 mg.
Died: February 3, 1908.
139 days.

P.M.—The right submaxillary gland formed a large mass of soft caseous substance. There were two tubercles in the small intestine, and four ulcers in the large intestine without any caseation. One mesenteric gland was large and caseous. Part of the right lung was solid, and contained caseous nodules; the left lung was normal. The bronchial glands were large and caseous. There were three or four tubercles in the spleen, one in one kidney.

CULTURE.

Derived from the bronchial gland of Monkey 186. The 4th generation was inoculated on May 9, 1908.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1771	Intrav.	1·0 mg.	D. 27 days	G. T.
1773	Intrav.	0·1 mg.	D. 78 ,,	G. T.
1774	Intrav.	0·01 mg.	D. 131 ,,	Chronic G. T.
1772	Subcut.	50·0 mg.	D. 152 ,,	Slight G. T. ? cause of death.
1770	Subcut.	10·0 mg.	K. 153 ,,	Slight T.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1466	Intrav.	1·0 mg.	D. 57 days	G. T.
1467	Intrav.	0·1 mg.	D. 54 ,,	G. T.
1469	Intrav.	0·1 mg.	D. 38 ,,	G. T.
1470	Subcut.	50·0 mg.	D. 106 ,,	Local T. and T. of lungs and kidneys, appparently retrogressive.
1471	Subcut.	10·0 mg.	K. 140 ,,	Local T. and slight T. of lungs, thoracic glands, diaphragm, and kidneys.
1468	Subcut.	1·0 mg.	K. 140 ,,	Local T. and moderately severe T. of lungs and kidneys; pleura and spleen also affected.

VI.—February 17, 1908.

The strain was derived from the original material through a guinea-pig, and had been 788 days in artificial cultivation.

The culture used was the 31st generation, 21 days old.

PONY 18 (yearling).

Intravenous.
Dose: 10·0 mg.
Died: March 28, 1908.
40 days.

P.M.—General tuberculosis.

PONY 20 (yearling).

Subcutaneous.
Dose: 50·0 mg.
Killed: June 26, 1908.
130 days.

P.M.—Small local lesion; six glands of the right prescapular group and four other adjacent glands showed varying degrees of caseation. In the lungs there were a few scattered translucent nodules; there was one in one kidney. The spleen and liver showed a few scattered minute tubercles.

RHESUS MONKEY 202.

Fed daily for six days with 10·0 mg.—60·0 mg. in all.
Killed: May 28, 1908.
101 days.

P.M.—There were one or two foci in the right tonsil, one submaxillary, both pharyngeal, and two cervical glands. There were 14 small grey nodules with caseous centres in the small intestine. The mesenteric and colic glands were beset with softening caseous patches and nodules. There was a soft yellow nodule in the spleen; the lung contained two soft yellowish nodules and four small tubercles. One coeliac gland contained a tubercle.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1659	Intrav.	1·0 mg.	D. 32 days	G. T.
1658	Intrav.	0·1 mg.	D. 22 ,,	G. T.
1660	Subcut	10·0 mg.	D. 110 ,,	G. T.

VIRUS E. II.—*continued.*

Culture Inoculations—*continued.*

VII.—April 10, 1908.

The strain was derived from the original material through a guinea-pig and had been 841 days in artificial cultivation.

The culture used was the 14th generation, 20 days old.

RHESUS MONKEY 208.
Fed once. Dose : 50·0 mg.
Died : August 3, 1908.
115 days.

P.M.—General tuberculosis, very severe in the mesenteric glands.

CALF 608.
Subcutaneous.
Dose : 100·0 mg.
Killed : June 29, 1908.
80 days.

P.M.—Prominent fibrous-walled cyst containing softening caseo-necrotic tissue at seat of inoculation. The left prescapular gland was largely replaced by firm necrotic gritty substance. A caseo-calcareous cord connected the gland with the tumour. One suprarenal body contained a caseous tubercle, and one thoracic gland a caseo-calcareous nodule. There were a few calcareous granules in the portal glands.

The small intestine showed along its whole length numerous slightly yellowish nodules (T.B.) The mesenteric glands were normal.

CULTURE.

Derived from the prescapular gland of Calf 608.
The 3rd generation was inoculated on August 4, 1908, into

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1877	Intrav.	0·1 mg.	D. 21 days	Acute G. T.
1878	Intrav.	0·01 mg.	K. 118 „	Chronic G. T.
1875	Subcut.	10·0 mg.	K. 118 „	Chronic T. not severe.
1876	Subcut.	10·0 mg.	K. 118 „	Chronic T. not severe.

CALF 606.
Subcutaneous.
Dose : 50·0 mg.
Killed : July 8, 1908.
89 days.

P.M.—Small ulcerated lesion at seat of inoculation ; in the underlying muscle were five nodules with purulent centres. The left prescapular gland contained two nodules, purulent with fibrous capsules. There was one tubercle in the lung and one in the liver, and two fibrous nodules were seen loosely attached to the stomach. A mediastinal gland contained a caseo-calcareous nodule surrounded by discrete tubercles, another, several caseous gritty tubercles, a third a single tubercle.

CALF 610.
Subcutaneous.
Dose : 20·0 mg.
Killed : July 10, 1908.
91 days.

P.M.—Small cyst with fibrous walls filled with caseo-pus, at seat of inoculation. The left prescapular gland contained a few caseous gritty tubercles. There was no tuberculosis elsewhere.

RABBITS.

Number.	Method	Dose.	Duration of Life.	Result.
1724	Intrav.	0·1 mg.	D. 58 days	G. T.
1722	Intrav.	0·01 mg.	D. 36 „	G. T
1723	Subcut.	10·0 mg.	D. 59 „	Local T. Very slight T. of lungs and kidneys. (?) cause of death.
1725	Subcut.	10·0 mg.	D. 45 „	Slight T. Cause of death not apparent.
1726	Subcut.	10·0 mg.	K. 178 „	Local T., and very slight T. of lungs and kidneys.

VIII.—July 23, 1908.

The strain was derived from the original material through a guinea-pig and had been 945 days in artificial cultivation.

The culture used was the 17th generation, 23 days old.

RHESUS MONKEY 216.
Subcutaneous.
Dose : 1·0 mg.
Died : September 27, 1908.
66 days.

P M.—General tuberculosis.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1849	Intrav.	1·0 mg.	D. 20 days	G. T.
1850	Intrav.	1·0 mg.	D. 33 „	G. T.

CALF 404. Virus E.

Subcutaneous inoculation of culture derived from the original material through a guinea-pig

Dose—10 milligrammes.

Date of Inoculation—April 30, 1906. [Age about 10 weeks.]

Killed—July 28, 1906. [89 days after inoculation.]

Clinical History.

The animal showed no sign of ill-health during the course of the experiment, and after the first month there was a considerable diminution in the size of the tumour.

Temperature.

The temperature was normal throughout.

Tuberculin Test.

July 26, 1906. [87 days after inoculation.] Rise of temperature, 0·7° C.

Weights.

	kilos.
April 30, 1906	37·64
July 28, 1906	45·80

Total gain in weight.—8·16 kilos.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—At the seat of inoculation on the left side of the neck there was an oval tumour, 3 cm. in greatest diameter, which on section was composed of curdy caseo-pus surrounded by a fibrous wall, 5 mm. in greatest thickness; on the internal surface of the wall there was some adherent caseous gritty material.

Prescapular Glands.—The left prescapular gland was firmer than normal and measured a little over 5 cm. in length, rather less than 2·5 cm. in breadth, and 1·3 cm. in thickness; under the capsule numerous discrete yellow tubercles, the largest 1 mm. in diameter, were seen; on section, similar tubercles were seen in the depth of the cortex; they were soft and slightly gritty from calcification; the cortex also contained a firm yellow caseous patch, 2 by 2 by 0·7 cm., gritty around the margins; the capsule over this was thickened.

The right prescapular gland was slightly enlarged, 5 by 2·5 by nearly 1·3 cm., and oedematous (recent tuberculin test).

Prepectoral Glands.—Normal.

Cervical Glands.—Normal.

Thorax.

Lungs.—The lungs showed throughout the parenchyma scattered petechial points of haemorrhage; no tubercles were seen.

Thoracic Lymphatic Glands.—The bronchial and mediastinal glands were not enlarged. The long caudal gland showed in the cortex scattered yellowish-white foci, some distinctly gritty; there were similar yellow points in the bronchial glands; the gland above the bifurcation of the trachea showed moderately numerous discrete yellow foci.

Heart and Pleura.—Normal.

Abdomen.

The peritoneal cavity contained a slight excess of fluid.

Spleen.—Normal.

Liver.—In the depth of the liver there was a nodule the size of a hemp-seed with grey fibrous margins and an irregular opaque yellow centre, not perceptibly calcareous.

Portal Glands.—Normal.

Kidneys and Suprarenal Bodies.—Normal.

Tongue, Tonsils, Pharynx and Intestines.—Normal.

Testes.—Normal.

Various Lymphatic Glands.

Submaxillary, Parotid, Axillary, Gastric, Mesenteric, Colic, Lumbar, Coeliac, Iliac, Precrural, Popliteal, Gluteal and Ischiatic Glands.—Normal.

The right renal gland contained about half a dozen opaque yellowish-white foci, just perceptibly gritty.

Microscopical Examination.

(Smear preparations.)

Left Prescapular Gland.—Moderately numerous tubercle bacilli.

Liver (nodule).—No tubercle bacilli.

Renal Gland.—Two tubercle bacilli.

Caudal Mediastinal Gland.—One clump containing about 20 tubercle bacilli.

CALF 406. Virus E. II.

Subcutaneous inoculation of culture derived from the original material through a guinea-pig.

Dose—10 milligrammes.

Date of Inoculation—April 30, 1906. [Age about 10 weeks.]

Killed—July 30, 1906. [91 days after inoculation.]

Clinical History.

The animal showed no sign of ill-health during the experiment. The local tumour diminished in size after the first month.

Temperature.

The temperature was normal throughout.

Tuberculin Test.

July 26, 1906. [87 days after inoculation.] Rise of temperature, 1·0° C.

Weights.

	kilos.
April 30, 1906	33·55
July 30, 1906	44·44

Total gain in weight.—10·89 kilos.

POST-MORTEM EXAMINATION.

Carcass in good condition

Local Lesion.—In the subcutaneous tissues on the left side of the neck there was a small oval tumour, measuring 4·5 by 3 by 2 cm. On section it showed in the centre an irregular cavity filled with an opalescent watery fluid, in which caseous flakes were suspended, and surrounded by dense yellowish-white caseous slightly gritty substance; the whole was enclosed within a fibrous capsule.

Prescapular Glands.—The left prescapular gland was enlarged for about three quarters of its length and measured 6 cm. in length, and 4 cm. by a little over 1·2 cm. at its broadest part. The enlarged part was indurated, and on section irregularly caseated; the caseous areas were dense, yellow, and slightly gritty from calcification. At the narrow extremity of the gland there was a small indurated patch in the cortex, closely beset with yellow caseous slightly gritty tubercles.

The right prescapular gland measured 5·1 by 1·6 by 1·3 cm., and was slightly oedematous.

Prepectoral and Cervical Glands.—Normal.

Thorax.

Lungs.—In the left cephalic lobe there was a grey translucent miliary tubercle, and one or two doubtful grey points. In the left caudal lobe under the pleura there was a tubercle, a little larger than a millet seed with a yellow centre and a reddish grey margin; there were also one or two minute translucent grey tubercles. In the right lobes under the pleura there were six nodules, ranging in size from a millet to a hemp seed, with yellow centres and grey margins, there were besides a few small semi-transparent tubercles. No tubercles were seen on section of the lung.

Thoracic Lymphatic Glands.—The left bronchial gland contained a millet-seed sized tubercle with a yellow centre; the tubercle readily shelled out from the gland substance.

The right bronchial and the dorsal mediastinal glands appeared normal.

Pleura and Heart.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—Normal.

Liver.—The liver showed on section a few minute yellow foci (no T.B.); otherwise normal.

Portal Glands.—Normal.

Kidneys.—Patches of the cortex of the left kidney were pale and fibroid; no tubercles were seen in either kidney.

Suprarenal Bodies.—Normal.

Tongue, Tonsils, and Pharynx.—Normal.

One retro-pharyngeal gland contained a millet-seed sized grey tubercle, in the centre of which were yellow points; the other pharyngeal gland was normal.

Small Intestine.—The mucous membrane in the lower part of the small intestine, mainly that covering the long Peyer's patch, showed numerous shallow pits or erosions with well-defined margins and somewhat congested floors; there was no thickening of the submucosa.

Large Intestine.—All the lymphoid follicles in the large intestine were slightly enlarged and congested; the mouths of the follicles were irregularly expanded but not definitely ulcerated.

Gastric Glands.—Normal.

Mesenteric Glands.—The terminal mesenteric glands (not enlarged) showed in the cortices fairly numerous firm irregular yellow tubercles, many slightly gritty from calcification, ranging in size from a mere point up to that of a millet seed; the glands as far as the middle of the mesentery were also affected but contained here and there only a minute yellow focus. In the anterior half of the mesentery the glands were normal.

The Ileo-Colic Glands contained numerous similar tubercles; those in the largest gland of the group were at one part aggregated together, forming a kind of network.

Colic Glands.—Several of the colic glands contained tubercles similar to those in the mesenteric glands.

Submaxillary, Axillary, Renal, Lumbar, Coeliac, Iliac, Precural, Popliteal, Gluteal, and Ischiatic Glands.—Normal.

Testes.—Normal.

CALF 504. Virus E. II.

Subcutaneous inoculation of culture derived from the original material through a guinea-pig.

Dose—50·0 milligrammes.

Date of Inoculation—January 30, 1907. [Age about 7 weeks.]

Killed when well—May 10, 1907. [100 days after inoculation.]

Clinical Notes.

At the seat of inoculation there was after 13 days a firm circular tumour about 10 cm. in diameter, which subsequently became soft and fluctuant. The right prescapular gland slowly increased up to 10 cm. in length. The condition of the animal was fair throughout.

Temperature.

The temperature remained normal throughout.

Tuberculin Test.

February 19, 1907. [20 days after inoculation.] Dose of tuberculin, 4·0 cc. (avian). Rise of temperature, 0·6° C.

Weights.

	kilos.
January 30, 1907	60·76
May 10, 1907	92·06

Gain in weight.—31·30 kilos.

POST-MORTEM EXAMINATION.

The carcass was in good condition.

Local Lesion.—At the site of inoculation on the right side of the neck there was a prominent tumour 7·5 cm. in diameter and 5·7 cm. in thickness. On section it was a fibrous-walled cyst, filled with curdy caseo-pus and serous fluid. The caseous masses were attached to the inner wall, but were easily scraped away leaving a smooth wall crossed by fibrous strands.

Right Prescapular Gland.—The right prescapular gland measured 9 by 5·1 by 3·8 cm. It was replaced to about three-quarters of its extent by masses of caseo-necrotic substance slightly pinkish in the centre; two had broken down forming small abscess cavities. The periphery of the nodules was made up of a close network of caseo-calcareous tissue and what remained of the gland substance contained discrete tubercles.

Left Prescapular Gland.—Measured 5·8 by 2·6 by 1·4 cm. Normal on section.

Prepectoral, Cervical, and Axillary Glands on both sides.—Normal.

Thorax.

Pleura and Diaphragm.—Normal.

Lungs.—The left lung showed beneath the pleura three or four minute transparent tubercles. In the margin of the posterior lobe there was a single grey nodule the size of a wheat-grain.

The right lung was normal.

Thoracic Glands.—The bronchial and mediastinal glands were normal except for an occasional minute yellowish focus.

Heart.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen (weighed 268 grammes).—Normal.

Liver and Gall-bladder.—Normal.

Portal Glands.—In one portal gland there was a minute gritty focus. The rest were normal.

Kidneys.—In the left kidney, at the junction of the cortex with the medulla, there was a minute translucent tubercle with a gritty centre. The right kidney was normal.

Suprarenal Bodies.—Normal.

Coeliac, Lumbar, and Iliac Glands.—Normal.

Renal Glands.—The right renal lymphatic gland showed eight slightly irregular yellowish tubercles up to a rape seed in size, some soft, some slightly gritty. The left renal gland was normal.

Alimentary Tract.

Tongue, Pharynx, Tonsils.—Normal.

Submaxillary, Parotid, and Retro-pharyngeal Glands.—Normal.

Small Intestine.—In about the first two feet of the small intestine there was a moderate number of soft yellow nodules, raised beneath the surface of the mucous membrane. They soon became sparsely distributed and finally were absent towards the lower part.

Large Intestine.—Normal.

Gastric Glands.—One gastric gland contained a gritty focus.

Mesenteric Glands.—The majority of the mesenteric glands contained in the cortices a few yellowish tubercles ranging up to a rape seed in size; nearly all were slightly gritty, a few were soft.

Ileo-Colic Glands.—The ileo-colic glands showed in the cortices moderately numerous yellow gritty tubercles.

Testes.—Normal.

Various Lymphatic Glands.

Precrural, Popliteal, Gluteal, Ischiatic, and Pudic.—Normal.

Larynx and Trachea.—Normal.

Microscopical Examinations.

(Smear preparations.)

Lung Emulsion.—A few tubercle bacilli seen.

Foci from the Left Kidney.—One long and two short tubercle bacilli seen.

Foci from the Mesenteric Gland.—One long tubercle bacillus seen.

Nodule from Small Intestine.—A few tubercle bacilli seen.

CALF 506. Virus E. II.

Subcutaneous inoculation of culture derived from the original material through a guinea-pig.

Dose—50 milligrammes.

Date of Inoculation—January 30, 1907. [Age 7 weeks.]

Killed—May 9, 1907. [99 days after inoculation.]

Clinical History.

The health of the animal remained good. The tumour soon softened and became fluctuant, but there was no ulceration of the skin.

Temperature.

The temperature remained normal throughout.

Tuberculin Test.

February 19, 1907. [20 days after inoculation.] Rise of temperature, 1·2° C.

Weights.

	kilos.
January 30, 1907	82·08
May 9, 1907	102·94

Gain in weight.—20·86 kilos.

POST-MORTEM EXAMINATION.

General condition good.

Local Lesion.—On the right side of the neck there was a somewhat prominent rounded tumour which measured 6·3 by 5·1 cm.; it did not infiltrate either skin or muscle. On section it was a fibrous walled cyst, traversed by cords of translucent tissue and filled with masses of soft caseous substance in a clear serous fluid.

Prescapular Glands.—The right prescapular gland measured 6·3 by 2·5 by 1·2 cm. On section it contained two nodules, one at each extremity, replacing about a third of the gland; they were composed of collections of caseo-calcareous granules. In the rest of the gland there were a few scattered tubercles.

The left prescapular gland measured 5·5 by 2 by 1 cm., and on section was normal.

Prepectoral Glands.—Normal.

Cervical Glands.—The right inferior cervical gland measured about 1 cm. in diameter, and was almost replaced by a collection of caseo-calcareous granules. Other cervical glands appeared normal.

Axillary Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—The lungs were crepitant. On the surface of the left posterior lobe, just beneath the pleura, there was a hard grey nodule 3·5 mm. in diameter. In the margin of the right anterior lobe there was a similar hard grey nodule 4·5 mm. in diameter. On the surface of left lung, close to the spinal column, just dorsal to the entrance of the bronchi, there was a collection of minute grey tubercles twenty to thirty in number, a few of which were opaque in the centre, but not gritty. In the rest of the lungs an occasional translucent focus could be seen. On section, the parenchyma appeared normal.

Mediastinal Glands.—Normal.

Bronchial Glands.—There was a translucent calcareous focus in one bronchial gland; other bronchial glands appeared normal.

Heart and Pericardium.—Normal.

Abdomen.

Omentum, Peritoneum, and Diaphragm.—Normal.

Intestines.—Normal.

Mesenteric and Colic Glands.—Normal.

Spleen.—The spleen weighed 198 grammes. The surface and substance were normal.

Liver.—Normal.

Portal Glands.—In the largest of the portal glands there were some scattered yellowish foci just visible, which, when crushed, cracked like egg-shells.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Renal, Coeliac, Lumbar, and Iliac Glands.—Normal.

Tongue, Tonsils, Larynx, and Pharynx.—Normal.

Various Lymphatic Glands.

Parotid, Submaxillary, Retro-pharyngeal, Precrural, Popliteal, Gluteal and Ischiatic Glands.—Normal.

Microscopical Examinations.

(Smear preparations.)

Portal Gland (foci).—One group of tubercle bacilli (7 or 8 in number).

Lung Nodule (Emulsion I.).—Moderately numerous tubercle bacilli.

Lung Nodule (Emulsion II.).—Numerous tubercle bacilli.

Prescapular Gland.—Numerous tubercle bacilli (with a moderate number of small clumps).

CALF 606. Virus E. II.

Subcutaneous inoculation with culture derived from the original material through a guinea-pig.

Dose—50·0 milligrammes.

Date of Inoculation—April 10, 1908. [Age 14 weeks.]

Killed when in good general health—July 8, 1908. [89 days after inoculation.]

Clinical History.

There was no sign of ill-health during the experiment.

Temperature.

The temperature was normal throughout.

Weights.

	kilos.
April 10, 1908	45·80
July 8, 1908	71·19

Gain in weight.—25·39 kilos.

POST-MORTEM EXAMINATION.

General condition good.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a small irregular ulcer in the skin, leading into a sinus lined by granulation tissue; it was surrounded by thick fibrous tissue. In the underlying muscle there were five fibrous nodules up to a pea in size with purulent centres.

Prescapular Glands.—The left prescapular gland measured 4·3 by 2·4 by 1·1 cm. On section it contained two nodules, the largest 1·2 cm. in diameter, composed of yellowish purulent substance enclosed in sharply limited fibrous capsules.

The right prescapular gland measured 4·2 by 2 by 1 cm. On section it was normal.

Prepectoral Glands.—Normal.

Cervical Glands.—Normal.

Thorax.

Lungs.—In the left lung, just beneath the pleura, there was a single grey submiliary tubercle with a calcareous centre.

Mediastinal Glands.—The caudal mediastinal gland was a little thickened at one part by a caseo-calcareous nodule 2 cm. in length and 1 cm. broad; the nodule easily shelled out from the gland substance and was surrounded by discrete caseous gritty tubercles which also easily shelled out.

In a second gland there were several caseous gritty tubercles up to a hemp seed. In a third gland there was a single caseo-calcareous miliary tubercle.

Bronchial Glands.—Normal.

Abdomen.

Stomach.—Loosely attached to the stomach were two fibrous nodules containing firm opaque streaks.

Liver.—In the depth of the liver there was a nodule the size of a hemp seed with a yellowish centre.

Other organs and lymphatic glands showed no tuberculosis.

Microscopical Examinations.

(Smear preparations.)

Prescapular Gland.—Numerous tubercle bacilli.

Lung (tubercle).—A few tubercle bacilli.

Mediastinal Gland.—Numerous tubercle bacilli.

Liver (nodule).—No tubercle bacilli.

Stomach (nodule).—No tubercle bacilli.

CALF 608. Virus E. II.

Subcutaneous inoculation with culture derived from the original material through a guinea-pig.

Dose—100 milligrammes.

Date of Inoculation—April 10, 1908. [Age 14 weeks.]

Killed—June 29, 1908. [80 days after inoculation.]

Clinical History.

There was no sign of ill-health during the experiment.

Temperature.

There were a few slight rises, the highest being 39·9° C. on the 19th day; the temperature was otherwise normal.

Weights.

	kilos.
April 10, 1908	39·90
June 29, 1908	45·35

Gain in weight.—5·45 kilos.

POST-MORTEM EXAMINATION.

Carcass in fair condition.

Local Lesion.—In the subcutaneous tissue on the left side of the neck there was a prominent tumour 13 by 7 by 6 cm. On section it was a thick fibrous walled cyst containing masses of softening yellow caseo-necrotic tissue partly adherent to the walls and partly free in a straw-coloured serous fluid.

There was a caseo-calcareous cord connecting the local tumour with the prescapular gland.

Prescapular Glands.—The left prescapular gland measured 6 by 3·5 by 2·5 cm. On section, about two-thirds was replaced by firm yellow necrotic substance, softening a little at one part and beset with minute calcareous granules.

The right prescapular gland measured 5·3 by 2·7 by 1·3 cm. On section it was normal.

Prepectoral Glands.—Normal.

Cervical Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs and Bronchial Glands.—Normal.

Mediastinal Glands. — In the caudal mediastinal gland—which was not enlarged—just beneath the capsule there was a caseo-calcareous nodule 5 mm. in diameter, contained within a thin fibrous capsule from which it easily shelled out.

Other mediastinal glands were normal.

Abdomen.

Intestines.—Along the whole length of the small intestine there were numerous slightly yellowish nodules, palpable and prominent on the mucous surface varying up to 3 and 4 mm. in diameter and occasionally aggregated into collections. At the place where they were most numerous about fifty were counted in 10 cm. length of gut.

Mesenteric Glands.—Normal.

Spleen.—Normal.

Liver.—Normal.

Portal Glands.—In the cortices there were a few irregular calcareous granules.

Suprarenal Bodies.—The right suprarenal body contained a single yellow caseous tubercle.

The left was normal.

All other organs and lymphatic glands showed no tuberculosis.

The animal had been paralysed for about a fortnight in the hind legs. On examination of the lumbar region of the spinal canal there was found a longitudinal fracture of a vertebra, with displacement ventrally, resulting in constriction of the cord at that spot.

Microscopical Examinations.

(Smear preparations.)

Emulsion of Prescapular Gland.—Numerous tubercle bacilli.

Emulsion of Suprarenal Body Tubercle.—Moderately numerous tubercle bacilli.

Intestinal Nodule I.—A few tubercle bacilli.

Intestinal Nodule II.—A few tubercle bacilli.

CALF 610. Virus E. II.

Subcutaneous inoculation with culture derived from the original material through a guinea-pig.

Dose—20·0 milligrammes.

Date of Inoculation—April 10, 1908. [Age 14 weeks.]

Killed when in good general health—July 10, 1908. [91 days after inoculation.]

Clinical History.

The animal showed no evidence of ill-health during the experiment.

Weights.

	kilos.
April 10, 1908	42·17
July 10, 1908	78·80

Gain in weight.—36·63 kilos.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—In the muscle at the site of inoculation there was a pear-shaped tumour measuring 7 by 3 cm. On section it was a cyst with fibrous walls filled with caseo-pus.

Prescapular Glands.—The left prescapular gland contained a few soft caseous gritty tubercles.

The right prescapular gland was normal.

All organs and other lymphatic glands showed no tuberculosis.

PONY 18. Virus E. II.

Intravenous inoculation with culture derived from the original material through a guinea-pig.

Dose—10·0 milligrammes.

Date of Inoculation—February 17, 1908. [Age—Yearling.]

Died—March 28, 1908. [40 days after inoculation.]

Clinical History.

The animal speedily began to show considerable respiratory distress and emaciated rapidly.

Temperature.

There was a slight rise between the 17th and 26th days, the highest point reached being 39·6° Centigrade. The temperature was otherwise normal.

Weights.

	kilos.
February 17, 1908	76·18
March 28, 1908	63·49

Total loss of weight.—12·69 kilos.

POST-MORTEM EXAMINATION.

Carcass emaciated.

Thorax.

Lungs.—The lungs were heavy and did not collapse normally; they floated as a whole, but small pieces sank in water. They were irregularly congested on the surface. On section they cut firm and showed the substance closely filled with a network of grey translucent tissue, leaving only small patches of emphysematous and oedematous lung tissue in between. The bronchi were full of fluid. In the right anterior lobe there were two yellowish necrotic firm nodules and small patches of similar substance, though less firm, were scattered throughout the lungs. These nodules when squeezed exuded purulent fluid.

Thoracic Lymphatic Glands.—The bronchial and mediastinal glands were firm and in the cortices there were bright yellow necrotic patches.

Abdomen.

Mesenteric Glands.—Many of the mesenteric glands were dark red with blood; they showed no areas of necrosis.

Intestines, Stomach, and Colic Glands.—Normal.

Spleen.—The spleen weighed 169 grammes; on section it was normal.

The glands in the hilum of the spleen were a little firm, and on section the cortices showed in parts indefinite yellowish patches, while the rest was grey and translucent.

Liver.—The liver had on the surface a mottled appearance from alternate light and dark red areas. On section the light areas were homogeneous in appearance, and the dark were congested and showed the interstitial tissue well marked, forming a translucent network. Beneath the surface there were sparsely scattered opaque yellowish nodules up to a millet seed. In the substance there were two small purulent nodules.

Portal Glands.—The portal glands resembled the splenic glands except that they were congested and showed more numerous yellow patches in the cortices, some of which were almost entirely yellowish.

Kidneys.—They showed scattered minute grey translucent foci, a few apparently a little opaque, they were not well defined from the rest of the substance; they were irregularly distributed, and in parts were numerous. On section they could be seen in the deeper parts of the cortices.

Coeliac Glands.—The coeliac glands resembled the splenic glands.

Iliac Glands.—In the iliac glands there were discrete translucent nodules, resembling lymphoid tissue.

The Posterior Pharyngeal Glands were a little congested.

Other organs and glands appeared normal.

Microscopical Examinations.

(Smear preparations.)

Lung (necrotic patch).—Numerous long slender beaded tubercle bacilli.

Lung (dark patch).—Numerous long slender beaded tubercle bacilli.

Spleen (substance).—Moderately numerous tubercle bacilli.

Liver (substance).—Moderately numerous tubercle bacilli.

Kidney (substance).—A few tubercle bacilli.

Bronchial Gland (cortex).—Numerous tubercle bacilli.

PONY 20. Virus E. II.

Subcutaneous inoculation with culture derived from the original material through a guinea-pig.

Dose—50·0 milligrammes.

Date of Inoculation—February 17, 1908. [Age—Yearling.]

Killed when in good general health—June 26, 1908. [130 days after inoculation.]

Clinical History.

A week after the inoculation there was a prominent swelling about 5 cm. in diameter in the shape of a cone, the apex of which was on the point of ulcerating. Within a few days the tumour ulcerated. There was no surrounding infiltration. On June 26 the ulcer had healed.

The animal at no time showed any sign of ill-health.

Temperature.

The temperature remained normal throughout the experiment.

Tuberculin Test.

May 13, 1908. [86 days after the experiment began.] Dose of tuberculin (bovine), 3·0 cc. Rise of temperature, 2·0° Centigrade.

Weights.

	kilos.
February 17, 1908	65·30
March 16, 1908	73·46
June 26, 1908	89·33

Total gain in weight.—24·03 kilos.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—At the seat of inoculation in the skin on the right side of the neck there was a whitish scar, pigmented around its margins. In the subcutaneous tissues beneath, there were a few discrete yellow caseous softening nodules with fibrous margins, the largest about the size of peas.

Prescapular Glands.—In the right prescapular group of glands there were two glands enlarged up to the size of a thrush's egg, which on section were almost replaced by firm yellow caseous substance; two smaller glands were partly caseous. Two others contained caseous tubercles and patches; the rest were normal. A prescapular gland on the left side was slightly enlarged and partly replaced by firm yellow caseous gritty patches.

Cervical Glands.—Two right inferior cervical glands were partly caseous. A third was beset with numerous small irregular caseous gritty nodules.

Thorax.

Lungs.—The lungs were pink and crepitant. On the surface of each lung beneath the pleura there were three or four perfectly translucent miliary nodules, varying from a millet seed up to a hemp seed in size. On section an occasional smaller grey tubercle was seen in the parenchyma.

Bronchial Glands.—Normal.

Abdomen.

Intestines.—Normal.

Mesenteric Glands.—Normal.

Spleen.—The spleen weighed 198 grammes. In the pulp there were a few minute round yellowish tubercles, which when crushed were soft in the centre and not appreciably gritty.

Liver.—In the liver there were very sparsely scattered minute irregular yellowish foci.

Kidneys.—In the cortex of the right kidney just beneath the capsule there was a single translucent miliary nodule. Kidneys otherwise normal.

Suprarenal Bodies.—Normal.

Other organs and lymphatic glands were normal.

Microscopical Examinations.

Smear preparations from the prescapular gland showed numerous tubercle bacilli; there was none in the lung, liver, spleen, or kidney.

Animal Inoculations.

Guinea-pigs 3234 and 3235 inoculated with an emulsion of lung and killed after 64 days were healthy.

Guinea-pig 3236 inoculated with an emulsion of liver and killed after 64 days was healthy.

Guinea-pig 3237 was inoculated with an emulsion of kidney, and when killed after 64 days showed from 30 to 40 fibrous tubercles up to a millet seed in size in the omentum. One nodule was seen in the liver and one on the diaphragm. There was also a few tubercles in the diaphragm. There was no disease elsewhere. A smear made with an omental nodule showed no tubercle bacilli.

PIG 184. Virus E. II.

Subcutaneous inoculation with culture derived from the original material through a guinea-pig.

Dose—10 milligrammes.

Date of Inoculation—May 15, 1907. [Age 9 weeks.]

Killed when in good health—February 7, 1908. [268 days after the experiment began.]

Temperature.

The temperature remained normal throughout.

Weights.

	kilos.
May 16, 1907	12·69
February 7, 1908	53·96

Gain in weight.—41·27 kilos.

Tuberculin Test.

June 13, 1907. [29 days after the experiment began.] Rise of temperature, ·5° Centigrade.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—In the subcutaneous tissue of the abdomen, to the left of middle line, there was a somewhat flattened circular tumour about 4 cm. in diameter, which on section was found to be a cyst filled with soft yellow caseous substance; it was adherent to the skin in which there was a small pigmented depression and also to the muscle. In the subcutaneous tissue and muscle around the tumour there were a few scattered caseous nodules.

Inguinal Glands.—The largest on the left side measured 4 by 3·5 by 1·5 cm. On section three-quarters of the gland consisted of softening caseo-calcareous substance, the other part was firm, grey and translucent with an occasional caseous patch. Of the other inguinal glands one was normal and three contained caseous nodules.

The right inguinal glands were normal.

Precrural Glands.—Normal.

Iliac Glands.—The left iliac glands contained discrete caseo-calcareous nodules.

The right iliac glands were normal.

Lumbar Glands.—The lumbar glands were large and several were almost completely replaced by waxy caseo-calcareous tissue. Other lumbar glands were partly caseous.

The left ventral mediastinal gland was greatly enlarged and practically replaced by firm caseo-calcareous tissue.

Thorax.

Pleura.—On opening the pleural cavities the visceral and parietal pleurae were found connected by numerous delicate fibrous adhesions.

On the parietal pleura on both sides and on the diaphragm there were numerous fibro-caseous nodules varying up to 1·5 cm. in diameter. The majority were flattened and squamous, others were loosely attached by fibrous fringes.

Lungs.—The lungs did not collapse normally and on palpation were found to be filled with hard nodules. The right anterior lobe was almost replaced by solid tissue which was in part reddish grey and in part caseous and softened. The rest of the lungs on both sides was fairly closely filled with similar nodules and masses up to 4 and 5 mm. in greatest measurement; their inferior margins were severely affected. On section these nodules were all similarly constituted, even the smallest; they consisted of an external portion of grey translucent tissue occasionally beset with caseous foci and a central mass of softening caseo-necrotic tissue.

Bronchial Glands.—The bronchial glands were all large and consisted almost entirely of caseo-calcareous tissue.

Mediastinal Glands.—The mediastinal glands were enlarged and beset with opaque foci.

Abdomen.

Omentum.—In the omentum there were two grey caseating nodules the size of a rape seed and a hemp seed respectively.

Intestines.—Normal.

Mesenteric Glands.—The majority of the mesenteric glands were enlarged and completely replaced by softened caseous gritty substance; a few small glands were partly replaced.

Spleen.—The spleen weighed 113 grammes. On the surface there were four grey peritoneal tubercles. On section through the substance there were two grey nodules up to a millet seed with caseo-calcareous centres.

Liver.—In the liver there were moderately numerous tubercles distributed throughout the substance varying from a grey point up to a translucent nodule, caseating in the centre, the size of a hemp seed.

Portal Glands.—The portal glands were large, consisting of firm grey tissue containing a network of waxy caseous nodules with central calcareous streaks.

Kidneys.—In the cortex of the left kidney just beneath the capsule there were visible four caseating tubercles up to a millet-seed in size. On section there were two more.

In the right kidney there were four nodules, two the size of hemp seeds.

Suprarenal Bodies.—Normal.

Coeliac Glands.—The coeliac glands contained several discrete irregular caseating nodules.

Tonsils.—In the tonsils there were numerous small collections of soft yellow substance.

Tongue, Pharynx, and Larynx.—Normal.

Cervical Glands.—A gland just anterior to the first rib on the left side was the size of a thrush's egg, and almost replaced by firm caseous tissue.

The corresponding gland on the right side was normal.

Submaxillary Glands.—One left submaxillary gland contained a caseous miliary tubercle, the rest were normal.

Microscopical Examination.

(Smear preparation.)

Tonsil (focus).—No tubercle bacilli.

PIG 186. Virus E. II.

Subcutaneous inoculation with culture derived from the original material through a guinea-pig.

Dose—50 milligrammes.

Date of Inoculation—May 15, 1907. [Age 9 weeks.]

Killed when ill—November 5, 1907. [174 days after the experiment began.]

Temperature.

The temperature was normal during the experiment.

Weights.

	kilos.
May 16, 1907	19·50
November 5, 1907	28·57

Gain in weight.—9·07 kilos.

Tuberculin Test.

June 13, 1907. [29 days after the experiment began.] Positive reaction. Rise of temperature, 1·1° C.

POST-MORTEM EXAMINATION.

General condition poor.

Local Lesion.—At the seat of inoculation in the subcutaneous tissue of the abdomen, to the left of the middle line, there was a tumour measuring 6 by 3·5 by 2 cm. There was no infiltration of either skin or muscle, and on section the tumour was found to be a cyst filled with soft caseous substance.

Inguinal Glands.—The left inguinal glands were enlarged, a few contained opaque foci, two were firm, with the cortices in a condition of early caseation, and one was a cyst filled with caseo-pus.

The right inguinal glands contained a few discrete caseous gritty tubercles.

Precrural Glands.—The precrural glands each contained a single opaque submiliary tubercle.

Iliac Glands.—The iliac glands showed a few discrete caseo-calcareous submiliary tubercles.

Lumbar Glands.—The lumbar glands were enlarged and contained numerous caseous gritty nodules easily shelling out.

Thorax.

Lungs.—The lungs did not collapse normally; about half of the substance of each lung, consisting of the inferior and dependent portions of the lobes, was composed of firm grey pneumonic tissue quite airless and beset with softening caseous gritty nodules. The rest of the lung substance was severely affected, but the pneumonic nodules were more discrete; the intervening lung tissue was markedly emphysematous.

Thoracic Lymphatic Glands.—The bronchial and mediastinal glands were enlarged and consisted of firm translucent tissue which was beset with fine caseous streaks and caseo-calcareous tubercles.

The left ventral mediastinal gland was enlarged and practically replaced by softening caseous gritty substance.

Abdomen.

Omentum.—In the omentum near the spleen there were scattered loosely attached fibrous nodules.

Diaphragm.—On the peritoneal surface of the diaphragm there was a moderate number of flattened translucent growths, many loosely attached and varying up to 5 mm. in diameter. There were several similar nodules on the pleura, a few of which were caseating.

Intestines.—Normal.

Mesenteric Glands.—The mesenteric glands appeared a little enlarged, but many were almost replaced by caseous gritty masses; others contained discrete nodules.

Spleen.—On the surface of the spleen there were eight loosely attached grey miliary tubercles. In the substance there was a large projecting nodule 1·3 cm. in diameter, which on section consisted of a ring of grey tissue surrounding a caseous centre. In the rest of the substance there was an occasional ill-defined caseous tubercle.

Liver.—The liver showed in the substance moderately numerous slightly irregular grey translucent tubercles, varying in size up to about a millet seed. In the centres of the larger tubercles there could just be seen minute central opacities. The superficial tubercles projected slightly above the surface.

Portal Glands.—The portal glands contained discrete caseous gritty nodules easily shelling out; the majority were submiliary, except when they were confluent.

Kidneys—The kidneys presented on the surface a mottled appearance from the presence of illdefined yellowish-grey patches slightly raised above the surface.

Suprarenal Bodies.—In the suprarenal bodies there were several irregular grey foci (not tuberculous).

Coeliac Glands.—The coeliac glands contained a varying number of caseous gritty tubercles.

Submaxillary and Cervical Glands showed a few discrete caseo-calcareous submiliary tubercles.

The pudic glands showed a few similar tubercles.

Testes.—In each testis there were two large pea-sized caseating nodules.

Tongue, Tonsils, Larynx, and Pharynx.—Normal.

Microscopical Examinations.

(Smear preparations.)

Bronchial Gland (translucent tissue) showed fairly numerous long tubercle bacilli.

Suprarenal Body (nodule).—No tubercle bacilli.

Kidney (nodule).—No tubercle bacilli.

RHESUS MONKEY 166. Virus E. II.

Subcutaneous inoculation of culture derived from the original material through a guinea-pig.

Dose—1·0 milligramme.

Date of Inoculation—May 15, 1907.

Died—June 3, 1907. [19 days after inoculation.]

Clinical History.

The animal refused its food and died without obvious cause.

POST-MORTEM EXAMINATION.

Local Lesion.—In the subcutaneous tissues of the back there was a tumour shaped like a small French bean pod consisting of fibrous tissue with a central cavity lined by thin greyish granulations filled with yellowish caseo-pus.

All organs and glands were normal to the eye.

Microscopical Examinations.

(Smear preparations.)

Lung (substance).—One tubercle bacillus seen.

Spleen (substance).—A few tubercle bacilli seen.

Liver (substance).—A few tubercle bacilli seen.

Kidney (substance).—No tubercle bacilli seen.

RHESUS MONKEY 168. Virus E. II.

Subcutaneous inoculation of culture derived from the original material through a guinea-pig.

Dose—10·0 milligrammes.

Date of Inoculation—May 15, 1907.

Killed when very ill—July 5, 1907. [51 days after inoculation.]

POST-MORTEM EXAMINATION.

Local Lesion.—At the seat of inoculation immediately under the skin of the back there was a flattened cavity 2·5 by 3·5 cm. which was covered by thin necrotic skin in which were several small ulcers; the cavity was lined by a small amount of caseous substance and had become secondarily infected. It was slightly adherent to the muscle but there was no infiltration.

Axillary Glands.—One right axillary gland was a little enlarged and contained soft caseous nodules which shelled out leaving clean walled cavities; the rest appeared normal.

In the left axilla there was a gland about the same size which contained a single soft caseous nodule; a second one showed two opaque foci beneath the capsule. The rest were normal.

Thorax.

Lungs.—The lungs collapsed normally. In the right anterior lobe there were two grey submiliary tubercles with opaque centres. In the right middle there were three similar tubercles and in the right posterior about ten, some of which were quite translucent. In the lobes of the left lung there were altogether only six similar tubercles some minute and quite transparent. In the lungs there were several pneumonyssi with surrounding zones of congestion.

Bronchial Glands.—The bronchial glands were not enlarged and appeared normal.

A vertebral gland on the right side between the 11th and 12th ribs contained a few soft opaque foci.

Abdomen.

Omentum.—The omentum was quite free from fat but showed no tubercles.

Intestines.—Normal.

Mesenteric and Colic Glands.—Normal.

Adherent to the peritoneum at the pyloric end of stomach there was a nodule nearly the size of a sparrow's egg filled with brownish pus; the wall and mucous membrane of the stomach were not affected.

Spleen.—The spleen was a little enlarged and firm and on section the Malpighian bodies were enlarged; some showed a minute soft caseous focus in the centre and others were to a varying extent replaced by soft caseous substance; the majority of the bodies were affected and attained the size of millet seeds.

Liver.—On the surface of the liver just beneath the capsule could be seen moderately numerous minute discrete grey tubercles varying up to less than one millimeter; the largest showed minute opaque centres. In the substance there were similar tubercles rather more sparsely scattered.

Portal Glands.—Two portal glands contained irregular soft caseous miliary tubercles.

Kidneys.—On the capsule of the right kidney there was a nodule about the size of a hemp seed containing yellow purulent substance.

The kidneys were pale but otherwise normal.

Suprarenal Bodies.—Normal.

The coeliac glands showed their cortices closely beset with tubercles similar to those in the portal glands.

Submaxillary and Inguinal Glands.—Normal.

Miscroscopical Examinations.

(Smear preparations.)

Spleen (emulsion).—Numerous tubercle bacilli.

Liver (emulsion).—A few tubercle bacilli.

Axillary Gland (nodule).—Very numerous tubercle bacilli.

Peritoneal Nodule on Stomach.—A few doubtful acid fast bacilli.

Kidney Capsule Nodule.—No tubercle bacilli.

RHESUS MONKEY 180. Virus E. II.

Subcutaneous inoculation of culture derived from the original material through a guinea-pig.

Dose—1·0 milligramme.

Date of Inoculation—September 17, 1907.

Died—December 27, 1907. [101 days after inoculation.]

POST-MORTEM EXAMINATION.

Local Lesion.—At the seat of inoculation over the left scapular there was a lens-shaped tumour measuring 6 by 3·5 by 1 cm. with a small opening in the skin from which a clear serous fluid exuded. On section it was a fibrous walled cyst with shaggy caseous internal walls containing soft caseous tissue.

Axillary Glands.—Of the five or six glands found in the left axilla, only one showed any sign of caseation; this was enlarged to about the size of a sparrow's egg and on section showed five nodules from a hemp seed up to a pea in size, filled with soft yellowish viscid pus which could be scraped away leaving a grey capsule.

Right Axillary Glands.—Normal.

Inguinal Glands.—Normal.

Thorax.

Lungs.—Both lungs were oedematous and slightly emphysematous. At the anterior extremity of the left caudal lobe there was an area of grey airless tissue which on section showed no caseation.

Bronchial Glands.—Normal.

Abdomen.

There was a hard pea-sized grey nodule in the abdominal wall with a soft caseous centre.

Omentum.—Normal.

Intestines.—Normal.

Mesenteric Glands.—Normal.

Spleen.—The spleen measured 5·5 by 2·5 by 1 cm. On section the Malpighian bodies were prominent and the pulp contained fairly numerous nodules from a point up to a pea in size; these nodules had grey translucent capsules filled with viscid yellow pus.

Liver.—The liver showed on the surface sparsely scattered flat grey thickenings from a point up to 1·5 mm. No caseous points could be seen in them. On section the substance was normal.

Kidneys.—Each kidney showed one softened yellow rape-seed sized caseous nodule.

Suprarenal Bodies.—Normal.

All the abdominal lymphatic glands appeared normal.

Microscopical Examinations.

(Smear preparations.)

Lung (grey patch).—No tubercle bacilli.

Spleen (nodule).—A few tubercle bacilli.

Liver (nodule).—No tubercle bacilli.

Kidney (nodule).—No tubercle bacilli.

Axillary Gland.—Numerous tubercle bacilli.

Peritoneal Nodule.—A few tubercle bacilli.

RHESUS MONKEY 184. Virus E. II.

Subcutaneous inoculation of culture derived from the original material through a guinea-pig.

Dose—0·1 milligramme.

Date of Inoculation—September 17, 1907.

Died—December 24, 1907. [98 days after inoculation.]

POST-MORTEM EXAMINATION.

Local Lesion.—At the seat of inoculation over the left scapular there was a pear-shaped tumour 7 by 5 by 3 cm.; it was tense and fluctuating. On section it was composed of yellowish caseated tissue, with a cavity at one end filled with caseous curdy pus. There was a small ulcer in the skin, and a few caseous nodules in the muscles.

Axillary Glands.—The glands in the left axilla were enlarged and showed a few large irregular caseous nodules.

The glands in the right axillary, and both inguinal regions were enlarged, but showed no caseation.

Thorax.

Lungs.—The lungs were pale; they showed scattered throughout the substance a moderate number of grey tubercles up to a rape seed in size, the largest having minute opaque centres.

Bronchial and Mediastinal Glands.—These glands were enlarged and oedematous, and contained a few soft yellowish caseous tubercles and nodules.

Abdomen.

Intestines.—The Peyer's patches of the small intestine were congested; there was no sign of caseation. The follicles of the large intestine were raised and showed minute caseous points. There were three or four caseous nodules in the large intestine, but no ulceration.

Mesenteric Glands.—The mesenteric glands were greatly enlarged; they showed large soft caseous nodules up to 7 mm. in diameter.

Colic Glands.—The colic glands were enlarged and oedematous; some of them showed large soft caseous nodules, like those in the mesenteric glands.

Spleen.—The spleen was slightly enlarged and was closely filled with soft caseous tubercles, the largest the size of a hemp seed, but the majority of them being the size of millet seeds; all had grey capsules.

The glands in the hilum of the spleen were oedematous, but showed no sign of caseation.

Liver.—The liver showed sparsely scattered small grey tubercles with caseous centres.

Portal Glands.—These glands were enlarged, and contained soft caseous nodules.

Kidneys.—Each kidney contained in the cortex about one dozen grey tubercles with soft caseous centres surrounded by zones of congestion.

Lumbar Glands.—The lumbar glands were about half replaced by soft caseous nodules.

Iliac Glands.—These glands showed small opaque points.

Tongue, Tonsils, Larynx, and Pharynx.—Normal. All the glands about the neck were normal.

Microscopical Examinations.

(Smear preparations.)

Lung (tubercle).—Moderately numerous tubercle bacilli.

Spleen (emulsion).—Moderate number of tubercle bacilli.

Axillary Gland.—Numerous tubercle bacilli.

Peyer's Patch.—No tubercle bacilli.

Large Intestine (follicle).—Numerous tubercle bacilli.

RHESUS MONKEY 186. Virus E. II.

Fed once with culture derived from the original material through a guinea-pig.

Dose—1·0 milligramme.

Date of Feeding—September 17, 1907.

Died—February 3, 1908. [139 days after the experiment began.]

Tuberculin Test.

January 31, 1908. [136 days after inoculation.] Dose of tuberculin, 0·2 cc. (bovine). No rise of temperature.

POST-MORTEM EXAMINATION.

Tongue, Tonsils, Larynx, and Pharynx.—Normal. On the right side of the neck in the submaxillary region there was a mass measuring 2·8 by 1·5 by 1·2 cm. On section it consisted of three adherent glands almost replaced by soft yellow caseous substance. One of the corresponding glands on the left side contained a caseo-purulent nodule the size of a hemp seed.

Cervical Glands.—There were a few ill-defined opaque foci in a right inferior cervical gland; other cervical glands on both sides were normal.

Abdomen.

Intestines.—On the intestines beneath the peritoneum near the pylorus, there was a pea-sized grey nodule with a caseous centre; in the rest of the small intestine there was a single grey submiliary tubercle beneath the mucous membrane.

In the caecum there was a serpiginous ulcer, the base of which was thin and formed by the peritoneum; there were three smaller ulcers, none of which showed any caseation.

Mesenteric Glands.—On one side of the mesentery the glands were little if at all enlarged, and one only contained a few opaque foci. On the other side two glands contained minute opaque foci; one was enlarged, measuring 2 by 1 by 0·8 cm.; it was almost replaced by soft caseous substance.

Colic Glands.—Two colic glands each contained a yellowish submiliary nodule.

Spleen.—The spleen on section showed a nodule composed of caseo-pus, within a grey capsule, the size of a wheat grain. There were also three tubercles the size of rape seed, two grey, one softening and opaque.

Liver.—Normal.

Kidneys.—In the depth of the cortex of the right kidney there was a single caseating miliary tubercle. Left kidney normal.

Suprarenal Bodies.—Normal.

Lumbar and Iliac Glands.—Normal.

Thorax.

Lungs.—In the left lung there was a small congested patch but no tubercles.

The posterior half of the anterior lobe of the right lung was solid and from the surface appeared grey with yellowish mottlings; on section it was composed of grey translucent tissue studded with yellow caseo-purulent nodules.

In the anterior part of the right posterior lobe there was a soft caseous nodule enclosed within a thin grey capsule 1 cm. in diameter; the rest of the anterior portion of the posterior lobe was reddish grey and contained several firm small translucent patches.

Thoracic Lymphatic Glands.—A left bronchial gland contained a soft miliary nodule. The bronchial glands above and below the bronchi were much enlarged, two being about the size of sparrow's eggs. On section they were almost replaced by soft yellow caseous substance.

Axillary Glands.—Normal.

A left inguinal gland was enlarged and contained a purulent nodule the size of a small pea.

Microscopical Examinations.

(Smear preparations.)

Bronchial Gland (emulsion).—Very numerous tubercle bacilli.

Mesenteric Gland (emulsion).—Numerous tubercle bacilli.

Caecum.—No tubercle bacilli.

MONKEY 202. Virus E. II.

Fed with culture derived from the original material through a guinea-pig.

Dose—60·0 milligrammes. [Administered in milk, 10 milligrammes each day for six days.]

Date of Feeding—February 17, 1908.

Killed when well—May 28, 1908. [101 days after first feeding.]

Clinical Notes.

The animal showed no sign of ill-health during the course of the experiment.

POST-MORTEM EXAMINATION.

Body in good condition.

Tonsils.—The right contained a soft caseous focus.

Submaxillary Glands.—In one gland on the left side there was a minute opaque focus. The other numerous glands in this region on both sides were normal.

Cervical Glands.—In a right superior cervical gland there were three minute opaque foci.

The corresponding gland on the left side showed a single opaque focus.

Other cervical glands were normal.

Retro-pharyngeal Glands.—The glands on each side contained a single soft opaque tubercle.

Small Intestine.—Beneath the mucous membrane, mainly of the first part, there were in all fourteen small firm grey nodules with central caseous softening. There was no ulceration.

Mesenteric Glands.—The mesenteric glands were moderately enlarged and on section consisted of glandular tissue, beset with irregular discrete softening caseous patches and nodules, which easily scraped out leaving normal gland tissue.

Colic Glands.—The majority contained irregular whitish nodules resembling those in the mesenteric glands.

Spleen.—In the pulp there was a single soft yellow miliary nodule within a thin translucent capsule.

Liver.—On the surface just beneath the capsule there were two small yellowish necrotic patches, not obviously tuberculous.

Coeliac Glands.—One contained a soft yellow tubercle the size of a rape seed.

Lungs.—The right lung showed three translucent tubercles, the largest the size of a rape seed and only one of which was slightly opaque in the centre.

In the caudal lobe of the left lung there was a translucent tubercle and two nodules the size of a hemp seed and a pea respectively. On section they had fibrous translucent walls and soft yellowish-white centres.

All other organs and glands were normal.

Microscopical Examinations.

(Smear preparations.)

Tonsil	A few tubercle bacilli.
Small Intestine ...	
Submaxillary Gland	
Left Cervical Gland	

Liver Nodule.—No T.B.

RHESUS MONKEY 208. Virus E. II.

Fed once with culture derived from the original material through a guinea-pig.

Dose—50 milligrammes. [Given naturally in sterilized milk.]

Date of Feeding—April 10, 1908.

Died—August 3, 1908. [115 days after feeding.]

POST-MORTEM EXAMINATION.

Tongue, Tonsils, Larynx, Pharynx, and Trachea.—Normal.

Submaxillary, Cervical, Axillary, and Inguinal Glands.—Normal.

Abdomen.

Intestines.—Beneath the mucous membrane of the small intestine there were in the first part moderately numerous yellow nodules up to a hemp seed in size, while in the latter part they became more sparsely scattered. In one Peyer's patch there was a small ulcer with raised congested margins.

Mesenteric Glands.—The mesenteric glands were enlarged, matted together and practically replaced by soft yellow caseous substance. The mesentery was contracted and in one part was obliterated, while in the rest, mainly near the intestines, there were collections of caseous tubercles.

Colic Glands.—Normal.

Spleen.—The spleen contained a moderate number of soft yellow caseous nodules within grey capsules, mainly about the size of rape seed and less, but varying up to nearly a hemp seed.

Liver.—The liver showed numerous minute irregular yellowish grey foci and a few tubercles the size of rape seed.

Kidneys.—In the cortices of the kidneys there were a few small translucent tubercles with minute opaque centres.

Suprarenal Bodies.—The right suprarenal body contained a soft caseous nodule the size of a pea. The left was normal.

Lumbar Glands.—Three lumbar glands were enlarged and contained a few discrete yellow miliary tubercles.

Thorax.

Lungs.—The lungs were very oedematous; they showed sparsely scattered soft caseous tubercles up to a millet seed in size.

Bronchial Glands.—Normal.

There were a few soft caseous miliary tubercles in the subcutaneous tissues about the body.

Testes.—Normal.

RHESUS MONKEY 216. Virus E. II.

Subcutaneous inoculation with culture derived from the original material through a guinea-pig.

Dose—1·0 milligramme.

Date of Inoculation—July 23, 1908.

Died—September 27, 1908. [66 days after inoculation.]

POST-MORTEM EXAMINATION.

Local Lesion.—At the seat of inoculation in the skin of the back there was a circular ulcer, with irregular ragged outline, about the size of a shilling piece; it was covered with a caseous scab. In the subcutaneous tissues around and beneath, there was a flattened caseo-necrotic tumour measuring about 5 cm.

in width, and 1 cm. in thickness. At the central part beneath the scab, the necrotic tissue had softened and formed a cystic cavity.

Axillary Glands.—In the axilla on the left side there were two moderately enlarged glands which on section were congested, partly necrotic and contained nodules of caseo-purulent substance. The remaining glands were slightly enlarged but showed no necrosis.

In the axilla on the right side there was one gland resembling the two on the left, while the rest were apparently normal.

A gland on the right side of the neck above the clavicle contained a caseous miliary tubercle.

Other cervical and submaxillary glands were normal.

Inguinal Glands.—In a left inguinal gland there was a small necrotic patch. The other glands were normal.

Thorax.

Lungs.—The lungs were crepitant and pale ; they were a little oedematous and emphysematous. They showed on the surface moderately numerous discrete, almost perfectly translucent tubercles, the majority about the size of rape seed. A few of the larger ones were very slightly opaque in the centre.

Bronchial Glands.—In each of two bronchial glands there was a single caseous tubercle.

Abdomen.

Intestines.—The small intestines were thin and translucent, they showed along the whole length numerous slightly thickened and opaque patches, consisting of collections of caseous foci.

Mesenteric Glands.—The mesenteric glands were enlarged, and to a great extent consisted of necrotic substance which could be easily separated from the capsule, between which and the former there was a layer of softening caseous substance.

Colic Glands.—Several of the colic glands showed softening caseous patches.

Spleen.—On the capsule of the spleen there were numerous greyish-white fibrinous patches forming a network, they were adherent but could readily be stripped off leaving a smooth surface. The spleen substance was dark and firm, having a reddish-grey mottled appearance. There could be seen in it scattered greyish nodules up to a millet seed in size ; they were not sharply limited.

Liver.—In the liver there was a yellowish grey necrotic patch.

Kidneys.—Normal.

Three lumbar glands each contained an opaque submiliary caseous tubercle.

A right iliac gland showed an opaque softening tubercle.

Brain.—On the surface of the brain there was a little capillary congestion. Otherwise it was normal.

Microscopical Examinations.

(Smear preparations.)

Intestine (caseous patch) *Mesenteric Gland* (emulsion)	Very numerous tubercle bacilli.

LEMUR 16. Virus E. II.

Subcutaneous inoculation with culture derived from the original material through a guinea-pig.

Dose—1·0 milligramme.

Date of Inoculation—November 21, 1906.

Died—December 26, 1906. [35 days after inoculation.]

Clinical History.

The animal had a fairly good appetite and appeared well until December 26 when it died suddenly

POST-MORTEM EXAMINATION.

Local Lesion.—In the subcutaneous tissue of the back adherent to the skin and muscle there was a flattened caseous tumour 6 by 5 cm., the central part of which was beginning to soften.

Axillary Glands.—The axillary glands on both sides were more than half caseous.

Thorax.

Lungs.—The lungs were congested, oedematous and markedly emphysematous, they contained moderately numerous minute translucent tubercles of which a few showed slight central opacity.

Bronchial Glands.—A few opaque foci were visible in the bronchial glands.

Abdomen.

Spleen.—The spleen was enlarged and measured 4·5 by 3 cm. It was firm and under the capsule could be seen numerous minute grey foci.

Liver.—In the liver there were just visible numerous grey points.

Kidneys.—The surfaces of the kidneys were roughened and the cortices showed numerous grey foci with here and there a definite greyish opaque tubercle. Numerous grey foci could be seen also in the medullae.

Lumbar and Iliac Glands.—Normal.

There was no tuberculosis of any other organ or gland.

Microscopical Examinations.

(Smear preparations.)

Lung *Spleen*	Numerous tubercle bacilli.
Liver *Kidney*	A few tubercle bacilli.

LEMUR 18. Virus E. II.

Fed once with culture derived from the original material through a guinea-pig.

Dose—1·0 milligramme.

Date of Feeding—November 21, 1906.

Died—February 5, 1907. [76 days after the experiment began.]

Clinical History.

For two months after the inoculation the animal remained apparently well. It then became quiet and its appetite began to fail. On the morning of February 5 it was found dead.

POST-MORTEM EXAMINATION.

Body was in moderately good condition but showed scarcely any subcutaneous and abdominal fat.

The submaxillary lymphatic and salivary glands were normal.

Cervical Glands.—In the centre of the left superior cervical gland there was a caseous patch replacing half, and composed of semi-translucent substance becoming soft and yellow towards the centre.

The corresponding gland on the right side was normal.

The left lower cervical glands, two in number, were normal.

A right lower cervical gland showed two opaque foci.

A gland, the size of a millet seed, under the left sterno-mastoid muscle contained an opaque focus.

A gland more posterior, at the entrance to the thorax on the left side, contained a caseous patch. On the right side it was normal.

In each lobe of the thymus there was an opaque yellowish body with a fibrous capsule the size of a pin's head.

Tongue, *Tonsils*, *Larynx*, *and Pharynx.*—Normal.

Posterior Pharyngeal Glands.—Normal.

Abdomen.

Omentum.—Normal.

Stomach.—Normal.

Intestines.—The small intestine was thin and transparent; sparsely scattered along its length, most numerous in the ileum, were small irregular ulcers with a very slight thickening around the margins which could be felt and was slightly opaque; they appeared to occur in the Peyer's patches which, hows ever, were difficult to make out definitely.

In the large intestine there were three or four small ulcers.

Mesenteric Glands.—The mesenteric glands formed a mass 3·5 by 2·5 cm. in greatest width; at the anterior extremity of this there was a gland the size of a robin's egg, and a similar gland at the ileo-colic end. Radiating from the central mass in the mesentery were several thickened lacteals, of which some were uniformly thickened and others contained discrete translucent tubercles. On section the glands were to a great extent composed of a soft yellow caseated tissue, which in several parts was becoming puriform.

Early caseous foci in one of two coeliac glands; a third gland contained a soft caseous patch.

Three glands at the first part of duodenum, from a wheat grain to a small pea in size, were considerably caseated, the largest softening.

Spleen.—The spleen was enlarged, measuring 7·5 by 3 cm. at its greatest diameter. On section it contained more than twenty nodules several of which were raised above the surface level; they were irregular in shape, not definitely limited from the surrounding pulp, and were composed of soft caseous tissue, partly semi-translucent, partly soft and yellow.

Liver.—The liver showed scattered minute grey tubercles, a few faintly opaque in the centre, situated both on the surface and in the substance.

Portal Glands.—One gland showed a soft yellow caseous nodule occupying one third of the gland substance.

Kidneys.—The cortices of the kidneys were very pale but showed no tubercles, except for one small opaque focus. In the pyramids there were minute grey translucent foci arranged radially.

Suprarenal Bodies.—Normal.

Lumbar Glands.—One lumbar gland 1 cm. in length was almost entirely composed of semi-translucent caseous tissue, opaque and yellow in parts. Several small glands were normal.

Iliac Glands.—Normal.

Thorax.

Diaphragm.—Normal.

Lungs.—The lungs were pink and a little oedematous; they showed sparsely scattered translucent tubercles with opaque centres, varying up to a millet seed in size.

Bronchial Glands.—Normal.

Posterior and Ventral Mediastinal Glands.—Normal.

Inguinal and Axillary Glands.—Normal.

Microscopical Examinations.

(Smear preparations.)

Liver.—A few tubercle bacilli seen.

Kidney (pyramid foci).—Two tubercle bacilli seen.

Thymus.—No tubercle bacilli seen.

Small Intestine (mucous membrane).—No tubercle bacilli seen.

Small Intestine (ulcer).—Numerous tubercle bacilli.

VIRUS E. III.

CULTURE INOCULATIONS.

I.—June 27, 1906.

The strain was derived from the original material through a guinea-pig and had been 188 days in artificial cultivation.

The culture used was the 9th generation, 21 days old.

CALF 440.

Subcutaneous.

Dose : 50·0 mg.

Died : September 7, 1906.

72 days.

P.M.—General tuberculosis.

RABBITS.

Number	Method.	Dose.	Duration of Life.	Result.
935	Intrav.	1·0 mg.	D. 12 days	Acute T.
936	Intrav.	0·1 mg.	D. 31 „	G. T.
939	Intrap.	1·0 mg.	D. 21 „	Acute T.
940	Intrap.	0·1 mg.	K. 99 „	G. T.
941	Subcut.	1·0 mg.	D. 75 „	G. T. not severe. Death from other causes.
942	Subcut.	0·1 mg.	D. 106 „	Local T., and T. of lungs and kidneys (severe).

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2114	Intrap.	1·0 mg.	D. 24 days	G. T.
2116	Intrap.	0·1 mg.	D. 28 „	G. T.
2113	Subcut.	1·0 mg.	D. 78 „	G. T.
2115	Subcut.	0·1 mg.	D. 94 „	G. T.

II.—November 24, 1906.

The strain was derived from the original material through a guinea-pig and had been 338 days in artificial cultivation.

The culture used was the 4th generation, 22 days old.

LEMUR 14.

Subcutaneous.

Dose : 1·0 mg.

Killed when dying : December 22, 1906.

28 days.

P.M.—General tuberculosis.

VIRUS E. III.—*continued.*

Culture Inoculations—*continued.*

III.—February 4, 1907.

The strain was derived from the original material through a guinea-pig, and had been 410 days in artificial cultivation.

The culture used was the 18th generation, 21 days old.

CALF 508.

Subcutaneous.

Dose : 50·0 mg.

Killed : April 18, 1908 (when dying).

73 days.

P.M. — General tuberculosis.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1234	Intrav.	1·0 mg.	D. 13 days	Acute T.
1235	Intrap.	1·0 mg.	D. 188 ,,	G. T. not sufficient to account for death.
1233	Subcut.	1·0 mg.	D. 121 ,,	Local T. and T. of lungs, kidneys, and thoracic glands.
1232	Subcut.	10·0 mg.	D. 63 ,,	G. T.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2362	Intrap.	1·0 mg.	D. 8 days	Acute T.
2363	Intrap.	1·0 mg.	D. 12 ,,	Acute T.
2364	Intrap.	1·0 mg.	D. 10 ,,	Acute T.
2365	Intrap.	1·0 mg.	D. 12 ,,	Acute T.
2361	Intrap.	1·0 mg.	D. 16 ,,	Acute T.
2366	Intrap.	1·0 mg.	D. 11 ,,	Acute T.

IV.—June 20, 1907.

The strain was derived from the original material through a guinea-pig, and had been 546 days in artificial cultivation.

The culture used was the 21st generation, 21 days old.

PIG 194.

Subcutaneous.

Dose : 10·0 mg.

Killed when very ill : August 22, 1907.

63 days.

P.M.—General tuberculosis.

CALF 440. Virus E. III.

Subcutaneous inoculation of culture derived from the original material through a guinea-pig.

Dose—50 milligrammes.

Date of Inoculation—June 27, 1906. [Age about 7 weeks.]

Died—September 7, 1906. [72 days after inoculation.]

Temperature.

The temperature was irregular, ranging between 38·8° and 39·8° Centigrade.

Weights.

	kilos.
June 27, 1906	39·45
September 7, 1906	36·25

Loss in weight.—3·17 kilos.

POST-MORTEM EXAMINATION.

General condition poor.

Local Lesion.—On the left side of the neck there was a large pendulous tumour which measured 16·5 by 12·7 by 6·5 cm. and weighed 792 grammes, with skin and muscle; it was adherent to and infiltrated skin and muscle and was also closely attached to the prescapular gland. In the central part of the skin over the tumour there was an oval area 7·5 by 5·5 cm., which was cut off from the rest by an ulcerated cleft. On section the tumour consisted throughout of firm fibro-caseous tissue with congested patches and a single small flattened cavity 4 cm. in length.

The tissues around, especially at the inferior part, were oedematous and thickened, and contained scattered caseous tubercles.

The Left Prescapular Gland.—The left prescapular gland was represented by a mass weighing 453 grammes, and measuring 11·5 by 7·5 by 7·5 cm.; it was adherent to skin, muscle, and local tumour. On section the gland proper measuring 9 by 5 cm. was found embedded in the centre, within a fibro-caseous capsule 2 cm. in thickness. The gland was composed throughout of firm caseo-necrotic tissue with gritty foci, except for a small part in the medulla.

Right Prescapular Gland.—The right prescapular gland was congested and contained three pea-sized caseous nodules with gritty centres.

Prepectoral Glands.—The left round prepectoral gland measured 3 cm. in diameter; it had two-thirds of its substance closely filled with caseous streaks and tubercles; the other third contained only scattered caseous foci.

The left reniform prepectoral gland similarly had about two-thirds of its substance closely filled with irregular yellowish tubercles with occasional opaque gritty foci.

The right round prepectoral gland the size of a large pea was firm and a few opaque foci were just visible in it.

The right reniform prepectoral gland contained a caseous nodule the size of a wheat grain.

Cervical Glands.—The inferior and superior cervical glands on the left side were greatly enlarged and were almost entirely replaced by yellowish semi-translucent tissue with a few calcareous foci.

The left middle cervical glands were closely filled with similar tubercles.

The cervical glands on the right side were congested but showed no tubercles.

Axillary Glands.—The left axillary gland was enlarged; the cortex was firm and showed numerous irregular yellowish foci.

The right axillary gland contained two caseous nodules.

Thorax.

Pleura.—The lymphatic fringes on the pleura were congested.

Diaphragm.—On the pleural surface of the diaphragm there was a single fibro-caseous nodule.

Lungs.—Both lungs showed irregular dark congested patches. The right cephalic, middle and part of the caudal lobes were hypostatically congested and sank in water. Evenly distributed throughout the lungs were numerous caseous nodules with grey margins, varying from a millet seed up to a nodule 1·2 cm. in diameter; many of them were surrounded by small areas of consolidation. In the substance in between there were very numerous minute translucent tubercles.

Thoracic Lymphatic Glands.

Bronchial Glands.—The bronchial glands on both sides were greatly enlarged, consisting of yellowish waxy tissue with calcareous foci embedded in a firm translucent matrix.

Mediastinal Glands.—The mediastinal glands were large, the caudal gland being 10 by 4 cm., and were similar in appearance to the bronchial glands.

Around the trachea at the apex of the thorax were numerous enlarged glands, the majority of which were closely filled with caseous streaks and tubercles with minute calcareous centres.

A ventral mediastinal gland was large and contained two caseous nodules.

Heart and Pericardium.—Normal.

Abdomen.

Omentum.—On the omentum there were scattered translucent nodules, loosely attached and congested, varying from a rape seed up to 1 cm. in diameter.

On the Diaphragmatic Peritoneum there were a few similar nodules.

Stomach.—In the mucous membrane of the stomach there was a projecting nodule 1 cm. in diameter, with a small ulcer over the centre, consisting of translucent tissue beset with caseous foci.

Intestines.—In the small intestine there were scattered caseous tubercles under the mucous membrane up to a millet seed; in the first part there was a patch of intestine with numerous discrete tubercles, many minute and one attaining the size of a wheat-grain; the largest were soft and caseous. There were also two ulcers about 2 mm. with caseous substance forming the base. In the large intestine there was a single small ulcer with raised margins and caseous centre.

Gastric Glands.—The gastric glands showed the cortices fairly closely filled with waxy caseous tubercles.

Mesenteric Glands.—The mesenteric glands contained large translucent nodules with a waxy caseous network and a few gritty foci; the glands were closely filled with them, but the majority were discrete, connected by gland tissue, containing only a few caseous foci.

The Colic Glands were similar.

Spleen.—The spleen weighed 141 grammes; on the surface there were a few loosely attached nodules; in the substance there was a moderate number of scattered tubercles varying from a millet seed up to 4 mm. in diameter; they consisted of a calcareous centre surrounded by yellowish waxy tissue with a grey translucent margin.

Liver.—On the surface of the liver there were scattered flattened fibro-caseous nodules, some loosely attached, others embedded in the substance; the liver substance contained moderately numerous grey tubercles varying from a point up to a hemp seed. The majority were minute, and the largest were opaque in the centre.

Portal Glands.—The portal glands were enlarged, having a nodular outline, and were closely filled with translucent nodules, diffusely caseous, up to 1·3 cm. in diameter.

Gall Bladder.—In the mucous membrane of the gall bladder there were two yellowish tubercles.

Kidneys.—The right kidney showed on the surface one greyish opaque hemp-seed sized tubercle and scattered grey foci.

Left kidney showed four similar tubercles up to a pea in size and sparsely scattered grey foci. On section both showed a few foci in the cortices.

Suprarenal Bodies.—In the left there were a few grey foci; in the right there were hemp seed-sized tubercles similar to those in the spleen.

Renal Lymphatic Glands.—The left was greatly enlarged and closely filled with irregular waxy nodules.

Coeliac Glands were enlarged, one closely filled with, and a second entirely replaced by, yellowish waxy nodules, some with irregular opaque calcareous centres.

Lumbar Glands showed a few similar nodules.

Iliac Glands.—The left iliac glands showed at one extremity a large diffusely caseous nodule. The right showed a single yellowish tubercle.

Alimentary Tract.

Tongue.—Normal.

Tonsils.—Both tonsils contained three or four soft yellowish nodules.

Pharynx was congested and showed a few translucent granules.

Larynx.—Normal.

Various Lymphatic Glands.

Parotid, Submaxillary, Retro-pharyngeal, Gluteal, Ischiatic, and Right Precrural Glands each showed one or more caseous nodules, ranging in size from a mere point up to a nodule replacing half the gland substance.

Popliteal and Left Precrural Glands.—Normal.

Eyes.—Normal.

Testes.—Normal.

Microscopical Examinations.

(Smear preparations.)

Right Tonsil (nodule).—No tubercle bacilli seen.

Pharynx (granule).—No tubercle bacilli seen.

CALF 508. Virus E. III.

Subcutaneous inoculation with culture derived from the original material through a guinea-pig.

Dose—50 milligrammes.

Date of Inoculation—February 4, 1907. [Age 8 weeks.]

Killed when dying—April 18, 1907. [73 days after inoculation.]

Clinical History.

The animal began to breathe quickly about three weeks after the inoculation. It became thin, with staring coat, and the respirations were increased in rapidity and were jerky.

Temperature.

The temperature was slightly raised (about 39·6) until the 64th day when it rose to 40·3° C. attaining its maximum point (40·4° C.) on the 67th day. It then fell and remained about normal until the animal was killed.

Weights.

	kilos.
February 4, 1907	69·38
April 18, 1907	64·39

Total loss in weight.—4·99 kilos.

POST-MORTEM EXAMINATION.

General condition poor.

Local Lesion.—At the seat of inoculation in the subcutaneous tissues on the right side of the neck, there was a somewhat flattened tumour measuring 23 by 12·5 by 5 cm. and weighing 792 grammes, with the skin and muscles, to both of which it was adherent and which it infiltrated. On section it consisted of firm pinkish caseo-necrotic substance, with gritty streaks and foci. The tissues around the local tumour and right prescapular gland were oedematous.

Prescapular Glands.—The right prescapular gland measured 9 by 4·5 by 5 cm. It was firm and on section consisted throughout of gritty caseo-necrotic tissue.

The left prescapular gland showed one caseous nodule the size of a hemp seed, and a few opaque tubercles.

Prepectoral Glands.—The right reniform prepectoral gland was enlarged and almost replaced by dense caseo-necrotic tissue.

The right round prepectoral gland, the size of a large pea, was diffusely caseous.

The left prepectoral glands each contained a few discrete caseous tubercles.

Cervical Glands.—The right inferior, right middle and right superior cervical glands were enlarged and resembled the prescapular gland.

The left inferior cervical gland showed a firm nodule with a fine caseous network replacing a quarter of the gland.

Other cervical glands showed a few scattered minute gritty tubercles.

Axillary Glands.—The axillary glands showed a few minute opaque foci.

Thorax.

Pleura.—The lymphatic fringes along the ribs and diaphragm were congested and several contained flattened fibro-caseous nodules.

There were similar nodules on the outer surface of the pericardium.

The tissues of the posterior mediastinum were oedematous.

Lungs.—The lungs were large and congested especially in the anterior lobes, which only just floated in water. The substance contained throughout numerous closely placed irregular nodules varying greatly in size. In structure they were all the same, consisting of firm grey tissue with varying amounts of caseation in the form of a network. There was marked lobular distribution and in many cases whole lobules were in a condition of caseous pneumonia.

Thoracic Lymphatic Glands.—The caudal mediastinal gland measured 13 by 5·5 and on section the greater part of the cortex was replaced by waxy caseous tissue with gritty foci.

The other mediastinal glands were large and firm and on section similar to the caudal mediastinal glands.

The bronchial glands were large and firm and replaced by tissue, in parts dense and waxy with gritty foci, in parts made up of a fine caseous network.

Heart.—In the centre of the heart muscle there was a grey translucent nodule.

The glands within the entrance to the thorax were congested and contained discrete caseous nodules.

Abdomen.

The omentum was deeply congested but showed no tubercles. In the peritoneal cavity there was a quantity of blood stained fluid.

Peritoneum.—The visceral and parietal peritoneum was injected and there were flakes of lymph on the intestine and omentum.

Intestines.—In the mucous membrane in the first part of the small intestine there were numerous soft yellow nodules up to a hemp seed; they were specially numerous in the Peyer's patches, where they had become confluent and had ulcerated causing considerable destruction of the patch. Many of the patches were deeply congested.

Parts of the mucous membrane of intestine were also ulcerated and deeply congested. The nodules diminished in number down the intestine.

In the large intestine also, there were a few similar nodules.

Mesenteric Glands.—The mesenteric glands were firm and they all contained caseo-calcareous tubercles in the cortices.

In many places the glands showed bright red congestion around the tubercles. In some glands the tubercles were discrete, in others they formed small nodules, and in a few replaced the cortices.

Spleen.—The spleen weighed 198 grammes. On section it showed moderately numerous discrete caseo-calcareous nodules varying up to 5 mm. in diameter.

Liver.—In the falciform ligament of the liver, and on the surface of the liver, around there was a crop of grey flattened tubercles, a few with minute opaque centres.

On the surface of the liver and in the substance there were scattered nodules varying greatly in size; the largest was 8 mm. in superficial diameter and 4 mm. in thickness; they were grey and translucent with caseous gritty centres.

Diaphragm.—On the peritoneal surface of the diaphragm, near the attachment of the falciform ligament, there were rows of translucent tubercles.

Portal Glands.—The portal glands were enlarged and firm and were to a great extent replaced by a network of caseo-calcareous nodules.

Kidneys.—In the cortex of the left kidney there was an occasional caseous miliary tubercle.

In the right there were also three caseous nodules, with grey margins and gritty centres, which extended a short way into the cortex as caseous streaks.

Suprarenal Bodies.—Each suprarenal body contained moderately numerous grey tubercles with caseous centres varying up to a millet seed in size.

Various Lymphatic Glands.

The Renal Glands resembled the portal glands.

The Coelic Glands showed in their cortices small irregular caseo-calcareous tubercles, discrete and in collections.

The Lumbar and Iliac Glands contained a varying number of discrete caseous gritty tubercles.

The Right Submaxillary Gland was greatly enlarged and resembled the prescapular gland.

In the right parotid there were a few opaque tubercles and one grey nodule with a fine caseous network.

In the gluteal glands there were discrete minute irregular caseo-calcareous tubercles.

The Popliteal, Precrural and Ischiatic Glands were similar to the gluteal glands.

Microscopical Examinations.

(Smear preparations.)

Kidney (tubercle).—Moderately numerous tubercle bacilli.

Small Intestine (nodule).—Moderate number of tubercle bacilli.

Large Intestine (nodule). — Numerous tubercle bacilli.

PIG 194. Virus E. III.

Subcutaneous inoculation of cultured derived from the original material through a guinea-pig.

Dose—10 milligrammes.

Date—June 20, 1907. [Age 14 weeks.]

Killed, very ill—August 22, 1907. [63 days after inoculation.]

Temperature.

The temperature varied between 38·9° and 39·8°C.

Weights.

	kilos.
June 21, 1907	24·03
August 22, 1907	24·92

Gain of weight.—0·89 kilos.

POST-MORTEM EXAMINATION.

Condition fair.

Local Lesion.—In the subcutaneous tissue to the left of the middle line, there was a flattened circular tumour 5 cm. in diameter and 1·5 cm. in thickness; it was adherent to skin and muscle in which there were a few discrete soft tubercles. On section it consisted of a cyst filled with soft caseous substance.

Inguinal Glands.—A left inguinal gland measured 5·5 by 4 by 1·5 cm. On section it was almost replaced by caseo-necrotic tissue, in parts pinkish, in others yellow with more opaque gritty streaks. Of three smaller glands one was firm, containing a few opaque foci; the other two contained caseous tissue similar to the first.

In the right inguinal glands there was an occasional opaque caseous focus.

Precrural Glands.—The left precrural gland contained a few soft caseous tubercles varying up to a millet seed in size.

Right precrural gland was similar.

Iliac Glands.—The right iliac glands contained a few discrete caseous tubercles, the majority minute, but an occasional one attaining the size of a millet seed.

One left iliac gland was enlarged and the cortex replaced by a caseous network. The remaining glands resembled those on the right side.

The Lumbar Glands contained tubercles similar to those in the right iliac glands.

Thorax.

Pleura.—Normal.

In the pleural cavity there was a little serous fluid.

Lungs.—The lungs were firm and did not collapse. The anterior lobes and the inferior margins of the posterior, consisted of firm grey consolidated and airless tissue; the rest of the posterior lobes consisted of masses of similar tissue, separated by small islands of emphysematous lung tissue. On section there were evenly distributed throughout the pneumonic areas moderately numerous discrete caseous submiliary tubercles.

Bronchial Glands.—The bronchial glands were enlarged and consisted of firm grey tissue containing small discrete irregular yellow caseous nodules.

Ventral Mediastinal Glands.—A left ventral mediastinal gland, the size of a thrush's egg, was replaced by caseo-necrotic tissue.

Right ventral mediastinal glands were normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Diaphragm.—Normal.

Spleen.—The spleen weighed 42 grammes. On section it contained two caseous nodules just beneath the capsule, one the size of a millet seed, the other 5 mm. in diameter ; the larger was softening in the centre.

Liver.—The liver showed beneath the surface and in the substance moderately numerous discrete grey tubercles about ·5 mm. in diameter, the majority with minute opaque centres.

Gall Bladder.—Normal.

Portal Glands.—There were in the portal glands, evenly distributed throughout the substance, a moderate number of discrete caseous tubercles varying up to a millet seed in size, and not appreciably gritty.

Kidneys.—In the cortex of right kidney there was a single translucent tubercle with a minute opaque centre.

Left kidney was normal.

Suprarenal Bodies.—Normal.

Tongue, Pharynx, and Larynx.—Normal.

Tonsils.—There was some yellow secretion in the crypts of the tonsils.

The submaxillary, coeliac, and prescapular glands on both sides contained a moderate number of discrete caseous tubercles up to a millet seed in size.

Stomach.—Normal.

Intestines.—The mucous membrane of the intestines was a little congested.

Mesenteric Glands.—The mesenteric glands showed sparsely scattered submiliary caseous tubercles.

The thyroid body contained an occasional caseous tubercle.

Testes.—Normal.

Microscopical Examinations.

(Smear preparations.)

Lung (tubercle).—Moderately numerous tubercle bacilli.

Lung (grey consolidated tissue).—Numerous tubercle bacilli.

Liver (tubercle).—A few tubercle bacilli.

Tonsil (secretion) }
Intestine (scraping from) } No tubercle bacilli.

LEMUR 14. Virus E. III.

Subcutaneous inoculation with culture derived from the original material through a guinea-pig.

Dose—1·0 milligramme.

Date of Inoculation—November 24, 1906.

Killed when dying—December 22, 1906. [28 days after inoculation.]

Clinical History.

A prominent fluctuating tumour formed which did not ulcerate until nearly four weeks after inoculation. The animal became more depressed during the third week. Subsequently it moved little, scarcely eating any food, and became very thin. On December 22 it was found moribund and was chloroformed.

POST-MORTEM EXAMINATION.

Local Lesion.—In the subcutaneous tissues of the back there was a tumour measuring 5 by 4·5 cm. At one extremity there was a small opening from which issued yellow purulent fluid. On section it was filled with pus, in which were soft caseous masses both free and attached to the walls.

Axillary Glands. — The left axillary gland was larger than the right and more than half replaced by early caseous substance.

In the right there were a few necrotic patches in the cortex.

Thorax.

Lungs.—In the lungs there were irregular areas of collapse and sparsely scattered grey tubercles, the largest the size of a millet seed with a caseous centre.

Bronchial Glands.—The bronchial glands showed early caseous foci in the cortices.

Abdomen.

Spleen.—The spleen was enlarged, measuring 9 by 3·2 cm. at its widest part. It was closely filled with slightly irregular grey tubercles up to a rape seed in size. At one part of the convex surface there was a necrotic patch 1·3 cm. in length, extending some way into the substance.

Liver.—The liver contained numerous minute discrete grey tubercles.

Kidneys.—In the cortices of the kidneys there were a few grey tubercles the size of rape seed and also numerous grey points of a doubtful nature.

There was no tuberculosis of any other organ or gland.

Microscopical Examinations.

(Smear preparations.)

Lung.—Numerous tubercle bacilli.

Liver.—Moderately numerous tubercle bacilli.

Spleen }
Kidneys } Numerous tubercle bacilli.
Bronchial Gland }

VIRUS E. IV.

CULTURE INOCULATIONS.

I.—April 30, 1906.

The strain was derived from the original material through a guinea-pig, and had been 115 days in artificial cultivation.

The culture used was the 6th generation, 21 days old.

CALF 408.

Subcutaneous.

Dose : 10·0 mg.

Killed : August 17, 1906.

109 days.

P.M.—Small cyst containing caseo-pus at seat of inoculation. The left prescapular gland contained two soft caseous nodules. There was no tuberculosis elsewhere.

CALF 410.

Subcutaneous.

Dose : 10·0 mg.

Killed : July 27, 1906.

88 days.

P.M.—Small cyst at seat of inoculation with caseo-purulent contents. The left prescapular gland showed at one end a number of soft caseous tubercles. A prepectoral gland contained calcareous tubercles. There was one tubercle in the liver and half-a-dozen in the thoracic glands.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
845	Intrav.	1·0 mg.	D. 19 days	Acute G. T.
844	Intrav.	0·1 mg.	D. 23 ,,	Acute G. T.
846	Intrap.	1·0 mg.	D. 28 ,,	G. T.
848	Intrap.	0·1 mg.	D. 47 ,,	G. T.
847	Subcut.	1·0 mg.	K. 112 ,,	Local T. and five tubercles in lungs.
849	Subcut.	0·1 mg.	K. 112 ,,	Local T. and six tubercles in lungs.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
1980	Intrap.	0·1 mg.	D. 30 days	G. T.
1979	Subcut.	0·1 mg.	D. 62 ,,	G. T.

VIRUS E. IV.—*continued.*

Culture Inoculations—*continued.*

III.—January 30, 1907.

The strain was derived from the original material, and had been 390 days in artificial cultivation.

The culture used was the 18th generation, 21 days old.

CALF 498.

Subcutaneous.
Dose : 50·0 mg.
Died : April 29, 1907.
89 days.

P.M. — Tuberculosis of lungs, suprarenal bodies, thoracic, and abdominal glands and intestines. One tubercle in the heart and one in the spleen.

RABBITS.

—	Number.	Method.	Duration of Life.	Result.
Emulsion of lung.	1319	Subcut.	D. 231 days	G. T.
Emulsion of renal gland.	1320	Subcut.	D. 365 „	Chronic G. T.

CALF 502.

Subcutaneous.
Dose : 50·0 mg.
Killed : April 30, 1907.
90 days.

P.M.—There were eight tubercles in the lungs and numerous grey opaque tubercles in the suprarenals. The thoracic and many abdominal glands contained one or more tubercles mostly small and translucent. In the small intestine there were three opaque foci.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1219	Intrav.	1·0 mg.	D. 14 days	Early T.
1220	Intrap.	1·0 mg.	D. 96 „	G. T.
1218	Subcut.	20·0 mg.	D. 35 „	G. T.
1217	Subcut.	10·0 mg	D. 150 „	Local T., and T. of lungs and kidneys.
1216	Subcut.	1·0 mg.	D. 154 „	Local T., and T. of lungs, kidneys, and thyroid body.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2353	Intrap.	10·0 mg.	D. 6 days	Acute T.
2348	Intrap.	1·0 mg.	D. 14 „	G. T.
2349	Intrap.	1·0 mg.	D. 8 „	Acute T.
2350	Intrap.	1·0 mg.	D. 9 „	Acute T.
2351	Intrap.	1·0 mg.	D. 11 „	Acute T.
2352	Intrap.	1·0 mg.	D. 17 „	G. T.

VIRUS E. IV.—*continued.*

CULTURE INOCULATIONS—*continued.*

II.—NOVEMBER 21, 1906.

The strain was derived from the original material through a guinea-pig and had been 320 days in artificial cultivation.

The culture used was the 15th generation, 21 days old.

BABOON 72.
Subcutaneous.
Dose: 1·0 mg.
Died: April 14, 1907.
144 days.

P.M.—Fibro-caseous local tumour. Adjacent glands large and caseo-purulent. The lungs contained about a dozen small tubercles, the spleen was filled with large caseo-purulent nodules, the liver contained sparsely-scattered tubercles, and each kidney two or three. Most of the lymphatic glands were affected, showing varying degrees of caseation and softening. On the omentum there were numerous nodules, the larger with caseous centres.

GUINEA-PIG 2420.
Emulsion of colic gland.
Killed: 228 days.
P.M.—Chronic general tuberculosis.

CULTURE.

Derived from the spleen of the guinea-pig. The 4th generation was used for inoculation on March 25, 1908; the total duration of artificial cultivation was 117 days.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1708	Intrav.	1·0 mg.	D. 13 days	Acute G.T.
1707	Intrav.	0·1 mg.	D. 19 „	Acute G.T.
1709	Subcut.	10·0 mg.	D. 59 „	G. T.
1710	Subcut.	10·0 mg.	D. 61 „	G. T.

CULTURE.

Derived from the spleen of Baboon 72. The 4th generation was used for inoculation on September 13, 1907; the total duration of artificial cultivation was 152 days.

RABBITS.

Number	Method.	Dose.	Duration of Life.	Result.
1462	Intrav.	1·0 mg.	D. 35 days	Acute G. T.
1464	Intrav.	0·1 mg.	D. 33 „	G. T.
1465	Subcut.	10·0 mg.	D. 103 „	Severe G. T.
1463	Subcut.	1·0 mg.	D. 143 „	Chronic G. T.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1080	Subcut.	20·0 mg.	K. 100 days (paralysed).	Local T., and T. of lungs and kidneys. Caseous abscess in spinal cord.
1079	Subcut.	10·0 mg.	D. 39 days	Local T. and slight T. of lungs, thoracic, and portal glands. Death due to secondary infection of local lesion.
1078	Subcut.	1·0 mg.	D. 46 „	Slight G.T., insufficient to account for death.

BABOON 74.
Fed.
Dose: 1·0 mg.
Killed: February 12, 1908.
448 days.

P.M.—One deep cervical and four mesenteric glands contained caseo-purulent nodules; several other mesenteric glands showed softened caseous foci. The lung, liver, and kidneys each showed a very few small tubercles.

CULTURE.

Derived from the mesenteric gland of Baboon 74. The generation was used for inoculation on April 28, 1908; the total duration of artificial cultivation was 76 days.

CALF 604.
Subcutaneous.
Dose: 50·0 mg.
Killed: July 28, 1908.
91 days.

P.M.—Local tuberculosis; three grey tubercles in liver, four small caseous nodules in mesenteric glands; no tuberculosis elsewhere.

CALF 612.
Subcutaneous.
Dose: 50·0 mg.
Killed: July 28, 1908.
91 days.

P.M.—Local tuberculosis; one small caseous nodule in lung, one caseous gritty nodule in a bronchial gland, four grey miliary tubercles in spleen; no tuberculosis elsewhere.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1751	Intrav.	1·0 mg.	D. 25 days	G. T.
1753	Intrav.	0·1 mg.	D. 71 „	G. T
1755	Intrav.	0·01 mg.	D. 104 „	Chronic G. T.
1750	Subcut.	50·0 mg.	K 174 „	Slight T.
1754	Subcut.	10·0 mg.	D. 42 „	Premature death; appeared to be developing G. T.
1752	Subcut	10·0 mg.	D. 171 „	Chronic G.T., slight, (?) cause of death.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2212	Subcut.	1·0 mg.	D. 97 days	G. T.
2211	Subcut.	0·1 mg.	D. 60 „	G. T.

VIRUS E. IV.—*continued.*

CULTURE INOCULATIONS—*continued.*

VI.—MARCH 11, 1908.

The strain was derived from the original material through a guinea-pig, and had been 795 days in artificial cultivation.

The culture used was the 13th generation, 22 days old.

CALF 616.

Subcutaneous.
Dose : 50·0 mg.
Killed : June 19, 1908.
100 days.

P.M.—The local tumour consisted of greyish tissue infiltrated with softened caseous substance. The left prescapular gland contained two caseous masses. Two cervical glands showed each a softening caseous nodule. A third of the mesenteric glands contained scattered soft opaque foci.

CULTURE.

Derived from the prescapular gland of Calf 616. The 3rd generation was used for inoculation on July 25, 1908.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1854	Intrav.	1·0 mg.	D. 26 days	G. T.
1853	Intrav.	0·1 mg.	D. 41 „	G. T.
1855	Subcut.	50·0 mg.	K. 131 „	Slight T.
1856	Subcut.	50·0 mg.	K. 131 „	Chronic T., not severe.

CALF 620

Subcutaneous.
Dose : 50·0 mg.
Killed : June 10, 1908.
91 days.

P.M.—Fibrous-walled cyst at seat of inoculation. The left prescapular gland was caseous and softening almost throughout; other adjacent glands were similar. There were nine fibrous nodules on the omentum, two miliary tubercles in one suprarenal, and scattered yellow nodules in the small intestine. Most of the lymphatic glands of the body were affected, and contained one or more tubercles or nodules, usually caseous and softened.

CULTURE.

Derived from the prescapular gland of Calf 620. The 3rd generation was used for inoculation on July 25, 1908.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1858	Intrav.	1·0 mg.	D. 26 days	G. T.
1857	Intrav.	0·1 mg.	D. 37 „	G. T.
1860	Subcut.	50·0 mg.	K. 131 „	Chronic T.
1859	Subcut.	10·0 mg.	K. 131 „	Slight chronic T.

PONY 22 (yearling).

Subcutaneous.
Dose : 50·0 mg.
Killed when ill : July 14, 1908.
125 days.
P.M.—General tuberculosis.

PONY 24 (yearling).

Intravenous (and partly subcutaneous).
Dose : 10·0 mg.
Died : June 17, 1908.
98 days.
P.M.—General tuberculosis.

RABBITS.

—	Number.	Method.	Duration of Life.	Result.
Emulsion of lung.	1799	Intrap.	K. 142 days	Local T. only.
Emulsion of kidney.	1800	Intrap.	D. 12 „	An acute infection.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1699	Intrav.	1·0 mg.	D. 32 days	G. T.
1698	Intrav.	0·1 mg.	D. 79 „	G. T. resembling that following a subcutaneous inoculation of a bovine virus.
1695	Subcut.	10·0 mg.	D. 87 „	Local T. and very slight T. of lungs and kidneys. The cause of death was not apparent.
1696	Subcut.	10·0 mg.	D. 164 „	Slight chronic G. T. The cause of death was not apparent.

VII.—APRIL 10, 1908.

The strain was derived from the original material through a guinea-pig and had been 825 days in artificial cultivation.

The culture used was the 15th generation, 20 days old.

RHESUS MONKEY 210.

Fed once.
Dose : 50·0 mg.
Killed when dying : June 26, 1908.
77 days.

P.M.—The Peyer's patches of the small intestine showed small ulcers, and caseous patches which formed the bases of the ulcers; the solitary follicles were prominent and greyish-white (T.B. very numerous). There were numerous ulcers in the large intestine. The mesenteric glands were greatly enlarged and caseous. There was a caseous miliary tubercle in the lung.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1728	Intrav.	0·01 mg.	D. 53 days	G. T.
1729	Subcut.	1·0 mg.	D. 72 „	Slight T.; died prematurely.
1727	Subcut.	0·1 mg.	D. 153 „	Chronic G. T.

VIII.—JULY 23, 1908.

The strain was derived from the original material through a guinea-pig and had been 30 days in artificial cultivation.

The culture used was the 18th generation, 23 days old.

RHESUS MONKEY 218.

Subcutaneous.
Dose : 1·0 mg.
Killed : October 26, 1908.
95 days.

P.M.—General tubreculosis, severe in spleen.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1851	Intrav.	1·0 mg.	D. 18 days	Acute T.
1852	Intrav.	1·0 mg.	D. 18 „	Acute T.

VIRUS E. IV.—*continued.*

CULTURE INOCULATIONS—*continued.*

IV.—MAY 15, 1907.

The strain was derived from the original material through a guinea-pig, and had been 495 days in artificial cultivation.

The 23rd generation of culture was used, 20 days old.

PIG 190.

Subcutaneous.

Dose : 50·0 mg.

Killed : November 6, 1907.

175 days.

P.M.—General tuberculosis, not severe.

PIG 188.

Subcutaneous.

Dose : 10·0 mg.

Killed when well : February 7, 1908.

268 days.

P.M.—General tuberculosis.

RHESUS MONKEYS 172 and 170.

Subcutaneous.

Doses : 10·0 and 1·0 mg.

Died : 7 and 24 days after inoculation of causes other than tuberculosis, and showed local tuberculosis only.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1333	Intrav.	0·1 mg.	D. 78 days	G. T. not severe.
1332	Subcut.	1·0 mg.	K. 265 „	Local T. and rather severe T. of pleura, lungs, and kidneys.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2487	Subcut.	1·0 mg.	D. 144 days	G. T. of a chronic fibroid type.
2488	Subcut.	0·1 mg.	D. 167 „	Very chronic G. T.

VIRUS E. IV.—*continued.*

Culture Inoculations—*continued.*

V.—September 17, 1907.

The strain was derived from the original material through a guinea-pig, and had been 620 days in artificial cultivation.

The culture used was the 8th generation, 22 days old.

RHESUS MONKEY 178.

Subcutaneous.

Dose : 1·0 mg.

Died : December 15, 1907.

89 days.

P.M. — General tuberculosis.

RHESUS MONKEY 182.

Fed.

Dose : 1·0 mg.

Killed : October 13, 1908.

392 days.

P.M.—There was a fibro-caseous nodule on the right side of the neck. The lungs contained scattered translucent tubercles. Three bronchial glands were enlarged and beset with caseous nodules. The liver contained four caseo-purulent cysts, and each kidney three or four small tubercles. A splenic gland showed a caseous nodule. Intestines and mesenteric glands normal.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1475	Intrav.	1·0 mg.	D. 32 days	G. T.
1476	Intrav.	0·1 mg.	D. 20 ,,	Acute G. T.
1477	Intrav.	0·1 mg.	D. 18 ,,	Acute G. T.
1474	Subcut.	50·0 mg.	D. 130 ,,	Local T. and slight T. of lungs and kidneys, retrogressive (? cause of death).
1472	Subcut.	10·0 mg.	D. 137 ,,	Local T., and T. of lungs and kidneys. Death due to injuries.
1473	Subcut.	1·0 mg.	K. 140 ,,	Local T. and slight T. of lungs.

CALF 408. Virus E. IV.

Subcutaneous inoculation of culture derived from the original material through a guinea-pig.

Dose—10 milligrammes.

Date of Inoculation—April 30, 1906. [Age about 10 weeks.]

Killed—August 17, 1906. [109 days after inoculation.]

Clinical History.

There was no alteration in the general condition during the experiment.

Temperature.

The temperature remained normal during the experiment.

Tuberculin Test.

July 26, 1906. [87 days after experiment began.] Rise of temperature, 1·7° C.

Weights.	kilos.
April 30, 1906	46·25
August 17, 1906	66·66

Total gain in weight.—20·41 kilos.

POST-MORTEM EXAMINATION.

General condition good.

Local Lesion.—On the left side of neck there was a flattened cyst measuring 5·1 by 2·5 cm.; it had fibrous walls containing soft caseo-pus and lined by greyish granulation tissue and fibrous trabeculae. In the fibrous wall there were discrete soft caseous tubercles.

Left Prescapular Gland.—The left prescapular gland measured 5·1 by 1·2 cm. On section it contained two nodules replacing more than half the gland; one consisted of soft caseous substance with a margin of translucent tissue, containing gritty foci; the second nodule was completely softened.

There was no tuberculosis elsewhere in the body.

CALF 410. Virus E. IV.

Subcutaneous inoculation of culture derived from the original material through a guinea-pig.

Dose—10 milligrammes.

Date of Inoculation—April 30, 1906. [Age about 10 weeks.]

Killed—July 27, 1906. [88 days after inoculation.]

Clinical History.

The health of the animal was good during the course of the experiment.

Temperature.

The temperature remained normal throughout the experiment.

Tuberculin Test.

July 26, 1906. [87 days after inoculation.] Rise of temperature, 1·4° C.

Weights.	kilos.
April 30, 1906	35·82
July 27, 1906	55·32

Total gain in weight.—19·50 kilos.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—In the subcutaneous tissues on the left side of the neck there was a hemispherical fluctuating swelling measuring 5·5 by 5·5 by 3 cm. which on section was found to be a cyst with fibrous walls (5 mm. in greatest thickness) and tenacious creamy yellow caseo-purulent contents; the cavity was crossed by slender fibrous trabeculae, and lined internally with a thin layer of pale granulation tissue containing gritty particles.

Prescapular Glands.—The left prescapular gland measured 5·5 by 2·5 by about 1 cm. and showed, towards one extremity, a number of soft caseous tubercles, varying up to a millet seed in size, slightly gritty from calcification; these tubercles occurred mainly in small groups and in one place were aggregated to form a caseous nodule about the size of a pea; the rest of the gland was normal.

The right prescapular gland was slightly enlarged (6 by 2·5 by 1·4 cm.) and on section oedematous and congested.

On the right side of the neck there was slight oedema at the site of inoculation of tuberculin, 24 hours earlier.

Prepectoral Glands.—One on the left side was slightly enlarged and contained about a dozen yellow calcareous tubercles, the largest not more than 0·5 mm. in diameter. Other prepectoral glands were normal.

Cervical Glands.—Normal.

Thorax.

Lungs.—The substance of the lungs was speckled with dark red points (petechial haemorrhages); in the anterior lobes there were several small collapsed lobules; no tubercles were seen.

Thoracic Glands.—The long dorsal mediastinal gland showed in the cortex a minute yellow speck.

The gland in front of the bifurcation of the trachea contained two small greyish tubercles with yellow centres (the tubercles projected from the cut surface). The left bronchial gland contained four yellow foci, one of which was entirely calcareous, and the right bronchial gland was normal.

Ventral Mediastinal Glands.—Normal.

Heart and Pleura.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—Normal.

Liver.—In the depth of the liver there was a pin-head sized tubercle with an opaque centre; otherwise the liver was normal.

Portal Glands.—Normal.

Kidneys and Suprarenal Bodies—Normal.

Tongue, Pharynx, Tonsils, and Intestines.—Normal.

Testes.—Normal.

Submaxillary, Pharyngeal, Parotid, Precrural, Iliac, Lumbar, Renal, Coeliac, Gastric, Mesenteric, Colic, Popliteal, Gluteal, and Ischiatic Glands.—Normal.

Microscopical Examinations.

(Smear preparations.)

Liver.—No tubercle bacilli.

Caudal Mediastinal Gland.—No tubercle bacilli.

Gland in front of bifurcation of Trachea—(?) One tubercle bacillus.

BABOON 72. Virus E. IV.

Subcutaneous inoculation with culture derived from the original material through a guinea-pig.

Dose—1·0 milligramme.

Date of inoculation—November 21, 1906.

Died—April 14, 1907. [144 days after inoculation.]

Clinical History.

A soft fluctuating tumour the size of a pheasant's egg was present in the subcutaneous tissue of the back 17 days after the inoculation. The skin over it was thinned and an ulcer formed a few days later. The animal remained well and in good condition until the middle of March. On April 6 it was noted that its appetite was beginning to fail and it died 8 days later.

Tuberculin Test.

February 8, 1907. [79 days after the experiment began.] Dose of tuberculin (bovine) 0·5 cc. Rise of temperature, 1·1 Centigrade.

POST-MORTEM EXAMINATION.

The animal was in fair condition although there was very little subcutaneous fat.

Local Lesion.—In the subcutaneous tissue of the back on the right side there was a flattened tumour, irregular but roughly circular and 5 cm. in diameter. In the skin over the centre there was a small puckered ulcer leading into a small cavity in the tumour, which on section consisted of fibroid tissue interspersed with soft caseous nodules. In the subcutaneous tissue, 5 cm. posterior to the former tumour, there was a second tumour the size of a sparrow's egg, similar to the first and also with an ulcer in the skin.

Axillary Glands.—In the right axilla there were numerous enlarged glands up to a pigeon's egg in size, which on section were filled with yellow caseo-purulent substance.

The glands in the left axilla were similar, but not so large or so numerous.

Inguinal Glands.—The left inguinal gland the size of a robin's egg was caseo-purulent throughout.

The right inguinal gland contained a single soft nodule.

Thorax.

There were four large caseo-purulent nodules on the heads of the ribs beneath the pleura on the right side.

Lungs.—The lungs were dark-red in colour and deeply congested, especially the left. They were voluminous and oedematous. The right showed on the surface three soft yellow miliary tubercles and an occasional grey focus.

The left showed three similar tubercles and a few grey foci. On section through the substance no more tubercles could be seen.

Bronchial Glands.—The bronchial glands on both sides were enlarged; one on the left was almost caseo-purulent throughout, the others contained soft yellow nodules.

The right sternal gland was enlarged and caseo-purulent.

Abdomen.

The abdomen was distended.

Peritoneum.—On the peritoneal surface of the diaphragm there were several small flat grey nodules.

Omentum.—The omentum contains numerous grey nodules with opaque centres varying up to a wheat grain, the largest being soft and caseous in the centre.

Intestines.—The large intestine and the caecum were distended with faecal matter, and there was a large hard mass in the rectum, the mucous membrane of which was congested and discoloured. Intestines were otherwise normal.

Mesenteric Glands.—The mesenteric glands were moderately enlarged, and in the majority the substance was to a great extent replaced by caseo-pus.

Several of the colic glands were similar, others appeared normal.

Spleen.—The spleen measured 7·5 by 3·5 in its greatest width and 2 cm. in thickness; it was irregular in outline and was filled with large yellow caseo-purulent nodules.

Soft caseous foci in the splenic lymphatic glands.

Liver.—The liver showed on the surface sparsely scattered tubercles; the majority were small and grey with minute soft centres, the largest, the size of hemp seed, each consisted of a thin grey capsule filled with caseo-pus. On section of the liver there was a similar but even more sparse distribution of tubercles.

Kidneys.—The left kidney showed in the cortex three soft caseous tubercles up to a millet seed.

The right kidney showed a few translucent foci.

Suprarenal Bodies.—Normal.

Abdominal Lymphatic Glands.—In the coeliac region, in apposition to the pancreas, there were three cystic glands filled with caseo-pus, ranging from a small pea up to nearly a thrush's egg in size.

A lumbar gland on each side was enlarged and filled with caseo-purulent nodules.

The iliac glands appeared normal.

Submaxilliary Glands.—The glands on the right side were enlarged and caseo-purulent; one on the left showed a soft yellow nodule.

Tongue, Tonsils, Larynx, and Pharynx.—Normal.

Microscopical Examinations.

(Smear preparations.)

Spleen *Axilliary Gland* *Colic Gland*	No tubercle bacilli seen.

BABOON 74. Virus E. IV.

Fed once with culture derived from the original material through a guinea-pig.

Dose—1·0 milligramme.

Date of Inoculation—November 21, 1906. [Age—Young.]

Killed—February 12, 1908. [448 days after the experiment began.]

Clinical History.

The animal remained perfectly well until April 6, 1907, when it lost its appetite, became very ill and weak and had cold extremities. It improved and was well again within a few days. There was no further disturbance of health subsequently, and the animal grew and was in excellent condition when killed.

Each time the animal was inoculated with tuberculin, subcutaneous nodules developed at the seat of inoculation about three weeks later: they subsequently disappeared. One was incised and found to contain a muco-purulent substance; no organisms could be found in it and culture tubes inoculated remained sterile.

Tuberculin Tests.

February 8, 1907. [79 days after inoculation.] Dose of tuberculin 0·5 cc. (bovine). Rise of temperature, 1·1° Centigrade.

May 7, 1907. [167 days after inoculation.] Dose of tuberculin ·1 cc. (bovine). Rise of temperature, 0·5° Centigrade.

May 30, 1907. [190 days after inoculation.] Dose of tuberculin ·2 cc. (bovine). Rise of temperature, 1·5° Centigrade.

January 31, 1908. [436 days after inoculation.] Dose of tuberculin 0·4 cc. (bovine). Rise of temperature, 1·4° Centigrade.

POST-MORTEM EXAMINATION.

General condition good.

Tongue.—Two or three of the follicles on each side of the dorsal surface at the root of the tongue contained opaque whitish foci in which no tubercle bacilli were demonstrated.

Tonsils.—Normal.

Larynx.—Normal.

Pharynx.—Normal.

Submaxillary Glands.—Normal.

Pharyngeal Glands.—Normal

Cervical Glands.—Normal.

Abdomen.

Omentum.—In the omentum there was a parasitic nodule the size of a large pea which on section contained a yellowish membrane.

Intestines.—Normal.

Mesenteric Glands.—In the mesentery there were four enlarged glands, the largest being the size of a sparrow's egg. On section they contained soft yellow caseo-purulent nodules which shelled out leaving cavities in practically normal gland substance. The largest was almost replaced by caseo-pus, the other three showing varying amounts of normal tissue.

Several smaller glands showed caseo-purulent foci: others were normal.

Ileo-Colic Glands.—Normal.

Spleen.—On the surface of the spleen there were two elevations the size of millet seeds, which on section consisted of soft grey translucent tissue from one of which a smear was made; there was also a third in the centre of the spleen; none of these was obviously tuberculous and they were probably enlarged Malpighian bodies.

Liver.—In the liver just beneath the surface there was seen one opaque yellowish nodule barely the size of a hemp seed. In the rest of the liver substance there were scattered minute grey foci irregularly distributed.

Portal Glands.—Normal.

Kidneys.—In the cortex of the left kidney just beneath the capsule there were about twelve minute soft translucent tubercles which easily shelled out of the substance. In the right kidney there were two; pelvis and medulla normal.

Suprarenal Bodies.—Normal.

Renal, Coeliac, Lumbar, and Iliac Glands.—Normal.

Thorax.

Lungs.—In the left anterior lobe there was a reddish-grey pigmented area. On the surface of the left lung just beneath the pleura there were three translucent tubercles with opaque centres the size of rape seed. The right anterior lobe contained a similar reddish-grey area, in which were three tubercles similar to those on the left side. In the right posterior lobe there were three tubercles up to a rape seed in size, and in the middle lobe there was one.

Bronchial Glands.—Normal.

Mediastinal Glands.—Normal.

At the apex of the thorax on the left side there was a gland the size of a sparrow's egg beset with soft yellow miliary nodules; the gland was probably a deep cervical gland.

Axillary and Inguinal Glands.—Normal.

Microscopical Examinations.

(Smear preparations.)

Spleen (nodule).—No tubercle bacilli.

Mesenteric Gland.—Two tubercle bacilli.

Liver (nodule).—No tubercle bacilli.

Kidney (tubercle).—No tubercle bacilli.

CALF 502. Virus E. IV.

Subcutaneous inoculation of culture derived from the original material.

Dose—50·0 milligrammes.

Date of Inoculation—January 30, 1907. [Age about 7 weeks.]

Killed when well—April 30, 1907. [90 days after inoculation.]

Clinical History.

There was no disturbance of the general health. The tumour did not begin to fluctuate until the middle of March.

Temperature.

The temperature varied between 38·6 and 39·6, the highest point reached being 39·8° C.

Tuberculin Test.

April 9, 1907. [69 days after inoculation.] Dose of tuberculin (bovine), 2·0 cc. Rise of temperature, 1·1° C.

Weights.

	kilos.
January 30, 1907	54·41
April 30, 1907	69·38

Total gain in weight.—14·97 kilos.

POST-MORTEM EXAMINATION.

The carcass was in good condition.

Local Lesion.—The tumour on the right side of the neck consisted of a cyst measuring 8 cm. in diameter and 4·5 cm. in thickness. On section the tumour had thick fibrous walls enclosing an irregular cavity filled with curdy caseo-purulent substance. Part of the wall of the tumour consisted of firm translucent fibrous tissue beset with soft caseous nodules and caseous gritty streaks. The walls of the cavity were covered by adherent soft caseous gritty substance.

Right Prescapular Gland.—The right prescapular gland measured 5·3 by 2·8 by 1·5 cm. On section one-third was normal except for two caseo-purulent nodules; the rest of the gland was firm, part being replaced by caseo-purulent nodules, and part showing an occasional soft nodule and small discrete caseous tubercles.

Left Prescapular Gland.—Measured 4·3 by 2 by 1 cm.; on section it was normal.

Prepectoral Glands, Right and Left.—Normal.

Cervical Glands.—The right inferior cervical gland was enlarged, measuring 3·5 by 2·5 cm. On section the capsule was thick and fibrous, enclosing a central mass of caseo-necrotic substance which was softening around the periphery and could be shelled out, leaving smooth walls.

The right, middle, and superior cervical glands were normal.

The left cervical glands were normal.

Axillary Glands.—Normal.

Thorax.

Pleura and Diaphragm.—Normal.

Lungs.—The left lung was pink and crepitant and the surfaces were normal except for a few small collapsed patches, not tuberculous, in the anterior lobe. In the centre of the lung substance there were two translucent tubercles, gritty in the centre, the size of rape seed.

On the surface of the right anterior lobe there was a translucent miliary tubercle containing two opaque foci. In the margin there was a hard grey nodule, moveable just under the pleura, about the size of a wheat grain. On the surface of the posterior lobe there were two grey tubercles the size of rape seeds and one the size of a millet seed. Section through the substance revealed one more grey miliary nodule with a little congestion around and another the size of a wheat grain with opaque foci in the centre.

Thoracic Glands.—The long mediastinal gland showed scattered minute opaque foci forming a small collection in one place.

The other mediastinal glands showed an occasional minute transparent tubercle with an opaque centre.

A left bronchial gland showed a moderate number of similar tubercles, and the right bronchial was similar. The tubercles were glassy with opaque and occasionally slightly gritty centres, varying in size up to a rape seed and a little larger.

Heart.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—The spleen weighed 141 grammes. The surface was normal and on section the substance also.

Liver.—The surface and the substance of the liver were normal.

Gall-Bladder.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—In each suprarenal arranged around the cortex and confined to it there were numerous tubercles varying up to a rape seed in size. They were translucent with varying amounts of opacity in the centre in which grittiness could not be detected.

Portal Glands.—In the cortices of the portal glands there was a moderate number of grey translucent tubercles, with slightly gritty centres easily picked out, up to a rape seed in size; occasionally they were aggregated to form small nodules. In one gland there were a few nodules the size of hemp seeds consisting of caseo-purulent substance within grey capsules.

Coeliac Glands.—Two out of three coeliac glands showed each a single opaque focus, glassy and not appreciably gritty. The third gland was normal.

Renal Glands.—In each renal lymphatic gland there were scattered in the cortices minute opaque slightly gritty foci easily picked out.

Lumbar and Iliac Glands.—Normal.

Alimentary Tract.

Tongue, Tonsils, Pharynx.—Normal.

Retro-pharyngeal and Submaxillary Glands.—The retro-pharyngeal and submaxillary glands on both sides were normal.

Intestines.—In the first part of the small intestine there were three minute soft opaque foci, one within a Peyer's patch.

The rest of the small intestine and the large intestine appeared normal.

Gastric Gland.—In a gastric gland there was a single tubercle.

Mesenteric Glands.—In the majority of the mesenteric glands there were minute translucent tubercles easily picked out.

Larynx and Trachea.—Normal.

Various Lymphatic Glands.

Precrural, Popliteal, Gluteal, and Ischiatic.—Normal.

Microscopical Examinations.

(Smears from.)

Left Lung.—Moderately numerous tubercle bacilli.

Suprarenal Body.—Numerous tubercle bacilli.

Small Intestine.—A few tubercle bacilli.

Coeliac Gland.—A few tubercle bacilli.

Renal Gland.—Moderately numerous tubercle bacilli.

CALF 498. Virus E. IV.

Subcutaneous inoculation of culture derived from the original material.

Dose—50·0 milligrammes.

Date of Inoculation—January 30, 1907. [Age about 7 weeks.]

Died—April 29, 1907. [89 days after inoculation.]

Clinical Notes.

The animal was in poor condition when inoculated as a result of diarrhœa and never improved. It became seriously ill on the 27th and died on the 29th of April.

Temperature.

The temperature rose to 40·1° C. on the 17th day, after which it slowly fell and remained normal until death.

Tuberculin Test.

April 9, 1907. [69 days after inoculation.] Dose of tuberculin (bovine), 2·0 cc. Rise of temperature, 1·0° C.

Weights.

	kilos.
January 30, 1907	34·91
April 29, 1907	31·75

Loss of weight.—3·16 kilos.

POST-MORTEM EXAMINATION.

The carcass was thin.

Local Lesion.—At the seat of inoculation on the right side of the neck there was an irregular thickening measuring 13 by 8 by 1·8 cm. It was adherent to the skin, which was thin, but not infiltrated or ulcerated; it was also adherent to the muscle.

On section it consisted of firm waxy caseated tissue containing gritty streaks and foci.

Right Prescapular Gland.—The right prescapular gland measured 6·5 by 4 by 2·5 cm.; on section the greater part of it consisted of caseo-necrotic tissue with gritty streaks, in the centre of which there was a portion breaking down to form caseo-pus. One extremity of the gland showed a few discrete caseous gritty nodules only.

Left Prescapular Gland.—The left prescapular gland measured 4·2 by 1·8 by 1 cm. On section it was oedematous, otherwise normal.

Cervical Glands.—A right middle cervical gland was caseous almost throughout.

A right superior cervical gland was practically replaced by waxy caseous tissue with gritty streaks. A second gland, deeper than the first, showed only an occasional tubercle the size of a rape seed. The right inferior cervical gland, 1·3 cm. in diameter, was caseous and gritty throughout.

The left middle cervical gland was almost replaced by caseous gritty tissue.

The left superior and inferior cervical glands were normal.

Right Prepectoral Glands.—The right prepectoral glands were slightly congested, otherwise normal.

Left Prepectoral Glands.—Normal.

Axillary Glands.—Normal.

Thorax.

Pleura and Diaphragm.—Normal.

Lungs.—The lungs did not collapse normally, and, except for the posterior extremities and scattered patches, were dark red and firm. At the apex of the left anterior lobe there was a large nodule measuring 7·5 by 4·5 cm. which on section consisted of grey tissue closely filled with a yellow caseous network; in the rest of the lobe there were several similar nodules, and in the dark red congested area, which sank in water, there were scattered caseous tubercles. About half the posterior lobe was dark red, and on section the substance was filled with nodules marking out the lobules; they were grey with a caseo-calcareous network; other lobules were congested and showed discrete tubercles. In the rest of the posterior lobe there were scattered patches, some merely congested, others in a condition of caseous pneumonia.

The right anterior and middle lobes and the tongue-shaped piece were dark red and sank in water, and about half the posterior lobe was similar. The condition was the same as in the left lung but was not so advanced, the nodules being smaller and firmer, and the greater part of their substance being firm and red and beset with caseous foci and caseo-calcareous tubercles.

Thoracic Glands.—The long mediastinal gland measured 9 by 3 by 2 cm. It showed in the cortex, which was firm, collections of caseo-calcareous tubercles and also scattered discrete tubercles up to a millet seed in size. The other mediastinal glands showed similar collections replacing parts of the cortices.

The left bronchial gland was firm and a considerable part of the cortex was replaced by a margin of caseo-calcareous tissue.

The glands within the entrance to the thorax were normal.

Heart and Pericardium.—Just beneath the visceral pericardium there were three grey submiliary tubercles with opaque centres. There was a tubercle in the muscle of an auricle.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—The spleen weighed nearly 85 grammes, and on section there was one caseous gritty tubercle the size of a rape seed.

Liver.—The surface of the liver was normal and on section also the substance.

Portal Glands.—One showed a few discrete caseo-calcareous tubercles, in a second they were moderately numerous, and in a third they were confluent around the cortex.

Gall Bladder.—Normal.

Kidneys.—The pelves were oedematous, the kidneys being otherwise normal.

Suprarenal Bodies.—The suprarenal bodies contained numerous discrete tubercles varying in size from a rape seed to a hemp seed. They consisted of a waxy caseous tissue becoming more opaque and finally gritty towards the centre.

Coeliac Glands.—The coeliac glands were small: one was normal, two contained caseous gritty submiliary tubercles, and a fourth showed soft caseous gritty nodules replacing the greater part of the cortex.

Renal Lymphatic Glands.—The renal glands showed moderately numerous irregular discrete caseo-calcareous tubercles varying in size up to nearly a hemp seed.

Lumbar Glands.—The majority of the lumbar glands were small and normal; one was somewhat enlarged and showed discrete rape-seed sized tubercles.

Iliac Glands.—One showed a few tubercles, the rest were normal.

Alimentary Tract.

Tongue, Pharynx, Tonsils.—Normal.

Submaxillary Glands.—The right submaxillary gland contained a caseo-calcareous nodule 1 cm. in diameter and an occasional tubercle. The left showed four submiliary tubercles.

Retro-pharyngeal Glands.—These contained discrete caseo-calcareous tubercles.

Intestines.—Small intestine. In the mucous membrane of the first part there were numerous soft yellow nodules the size of millet seeds. The Peyer's patches were thickened and raised by collections of soft caseous tubercles. A few minute ulcers could be seen. In the mucous membrane of the rest of the intestine the tubercles became more sparse and appeared as slightly flattened grey elevations of mucous membrane, the Peyer's patches, however, still containing soft caseous nodules.

Large intestine. In the large intestine there were scattered greyish elevations about 1 mm. in diameter.

Gastric Glands.—Some of the gastric glands showed discrete caseo-calcareous tubercles.

Mesenteric Glands.—Several mesenteric glands at the anterior and posterior parts were firm and had a considerable part of the margins of their cortices replaced by caseo-calcareous tissue. All the other glands contained varying numbers of discrete caseo-calcareous tubercles.

Larynx and Trachea.—Normal.

Testes.—Normal.

Various Lymphatic Glands.

Precrural, Popliteal, Gluteal, and Ischiatic.—Normal.

Microscopical Examinations.

(Smear preparations.)

Small Intestine—

(1) Grey tubercle. Tubercle bacilli, a moderate number seen.

(2) Caseous tubercle. Tubercle bacilli, a moderate number seen.

Lung (large caseous nodule from).—Tubercle bacilli numerous, in small clumps.

Suprarenal Body (tubercle from).—Tubercle bacilli numerous, in small clumps.

Auricle (tubercle from).—A few tubercle bacilli seen.

Bronchial Gland.—Tubercle bacilli, a moderate number seen.

Renal Gland. — Tubercle bacilli, moderately numerous.

PIG 188. Virus E. IV.

Subcutaneous inoculation with culture derived from the original material through a guinea-pig.

Dose—10 milligrammes.

Date of Inoculation—May 15, 1907. [Age 9 weeks.]

Killed in good health—February 7, 1908. [268 days after the experiment began.]

Temperature.

The temperature remained normal throughout the experiment.

Weights.

	kilos.
May 16, 1907	17·68
February 7, 1908	59·39

Gain in weight.—41·71 kilos.

Tuberculin Test.

June 13, 1907. [29 days after the experiment began.] Positive reaction. Rise of temperature, 2·1° Centigrade.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—In the subcutaneous tissues on the left side of the abdomen there were numerous caseo-calcareous nodules mainly about the size of a hemp-seed but varying up to that of a pea; they covered a considerable area. Extending from these to the left inguinal glands were two thickened lymphatics filled with a chain of caseous nodules.

Inguinal Glands.—The left inguinal glands were enlarged and replaced by softening caseous gritty tissue.

The right inguinal glands contained discrete caseous nodules up to a wheat grain in size, which easily shelled out.

Precrural Glands.—The left precrural gland showed twelve, and the right showed three, yellow caseating nodules up to 4 mm. in diameter.

Lumbar Glands.—All the lumbar glands contained numerous soft caseous nodules replacing the greater part of the gland substance.

Iliac Glands.—Three iliac glands resembled the lumbar glands, while three others had only one or two nodules in each. One other iliac gland was normal.

The left ventral mediastinal gland was only the size of a large pea but was caseous throughout.

Thorax.

Pleura.—The pleura covering the ribs showed scattered yellow caseous gritty nodules up to 3 and 4 mm. in diameter.

Lungs.—The lungs did not collapse normally; they showed scattered areas of consolidation and the inferior margin of the right posterior lobe was in part composed of grey translucent tissue. The lung parenchyma itself showed evenly distributed throughout numerous discrete caseo-calcareous tubercles varying, for the most part, up to a hemp seed in size.

Stretching from the lung to the parietal pleura were numerous delicate fibrous adhesions.

Bronchial Glands.—The bronchial glands were moderately enlarged, but were almost completely replaced by softened caseo calcareous tissue.

Mediastinal Glands.—In the mediastinal glands there was an occasional caseous nodule.

Abdomen.

Omentum.—The omentum showed one millet-seed sized yellow caseous nodule and moderately numerous minute pinkish translucent tubercles.

Intestines.—Normal.

Mesenteric Glands.—All the mesenteric glands contained soft yellow gritty caseous nodules; those in the middle of the mesentery being almost entirely replaced.

The colic and ileo-colic glands were similar.

Spleen.—On the surface of the spleen there was a patch of grey translucent fibrous tissue which contained a hemp-seed sized yellow gritty nodule. The spleen substance showed numerous projecting soft yellow caseous gritty nodules up to 5 mm. in diameter, which easily shelled out leaving grey capsules.

Liver.—On the convex surface of the liver just beneath the capsule there were numerous nodules similar to those in the spleen; the largest attained 8 mm. in diameter. In places they formed a coarse network. The concave surface was not severely affected. On section similar nodules were fairly closely placed throughout the substance.

Portal Glands.—One portal gland was entirely, and two others were almost, replaced by yellow softening gritty caseous substance. Three other glands showed yellow caseous nodules.

Kidneys.—The left kidney showed in the cortex just beneath the capsule 12, and the right kidney 18, yellow caseous nodules with grey capsules from a pinhead up to a pea in size. On section there was a moderate number of similar nodules (chiefly pea-sized) scattered throughout the cortex.

Suprarenal Bodies.—Normal.

Coeliac Glands.—The coeliac glands were about one-third replaced by yellow gritty softening nodules up to 1 cm. in diameter; which easily shelled out of the substance.

The submaxillary, cervical and prescapular glands, each showed a moderate number of soft yellow caseous nodules up to 4 and 5 mm. in diameter.

Tonsils.—Each tonsil showed one or two small collections of soft yellow substances.

Tongue, Larynx and *Pharynx.*—Normal.

Testes.—The testes were firm, and on section the left was almost replaced by confluent yellow caseo-calcareous nodules. The right was also severely affected, being closely filled with caseo-calcareous nodules and small masses. On the outer surface of the testes, and on the tunica vaginalis there were flattened reddish fibro-caseous growths.

The epididymes were firm and fibroid, and showed a few caseous nodules.

Pudic Glands.—The pudic glands were enlarged and contained caseous nodules.

PIG 190. Virus E. IV.

Subcutaneous inoculation with culture derived from the original material through a guinea-pig.

Dose—50 milligrammes.

Date of Inoculation—May 15, 1907. [Age 9 weeks.]

Killed when in good health—November 6, 1907. [175 days after the experiment began.]

Temperature.

The temperature remained normal during the experiment.

Weights.

	kilos.
May 16, 1907	18·58
November 6, 1907	47·15

Gain in weight.—28·57 kilos.

Tuberculin Test.

June 13, 1907. [29 days after the experiment began.] Positive reaction. Rise of temperature, 1·1° C.

POST-MORTEM EXAMINATION.

General condition good.

Local Lesion.—In the skin at the seat of inoculation, to the left of the middle line of the abdomen, there was a small pigmented scar beneath which, in the subcutaneous tissues, there were a few caseo-calcareous tubercles scattered over a rather large area.

Inguinal Glands.—One left inguinal gland, the size of a partridge's egg, was a cyst filled with softening caseous gritty substance.

Two smaller glands were normal.

In one right inguinal gland there was a single minute opaque tubercle ; the rest were normal.

Precrural Glands.—Normal.

Iliac Glands.—One left iliac gland was composed throughout of caseous gritty substance ; a second gland contained discrete caseous nodules. On the right side one gland showed a few opaque foci.

Lumbar Glands.—In several of the lumbar glands there were discrete caseous tubercles.

Thorax.

Pleura.—On the parietal pleura there was a single flattened caseous miliary nodule. The lymphatic fringes on the pleural surface of the diaphragm contained minute fibroid tubercles.

Lungs.—The lungs were crepitant but a little congested and did not collapse quite normally. On the surface the lymphatic fringes were prominent. Throughout the lung substance there were moderately numerous discrete yellowish caseo-calcareous tubercles varying up to about a millet seed in size and easily picked out of the substance. In the anterior lobes and the inferior margins of the caudal lobe they were more numerous and occasionally formed larger nodules, and small areas of lung tissue around these nodules were reddish-grey and airless.

Thoracic Lymphatic Glands.—The bronchial glands were slightly enlarged and contained caseo-calcareous nodules.

Two of the mediastinal glands were similar ; in the rest there was an occasional opaque focus.

The left ventral mediastinal gland was replaced by caseo-necrotic substance.

Abdomen.

Intestines.—Normal.

Mesenteric Glands—The majority of the mesenteric glands contained nodules similar to those in the bronchial glands while a few showed discrete tubercles.

Spleen.—The spleen weighed 85 grammes ; it contained moderately numerous yellowish caseo-calcareous tubercles varying up to a millet seed in size ; many could be seen just beneath the surface and several projected slightly from it.

Liver.—In the liver there were, sparsely scattered throughout the substance and evenly distributed, minute spherical calcareous tubercles, some opaque and yellowish, others transparent, but all easily picked out of the substance.

Portal Glands—The portal glands were enlarged, containing caseous gritty masses replacing a considerable part of the substance.

Gall Bladder.—Normal.

Kidneys.—In the cortex of each kidney there was a minute glassy calcareous tubercle.

Suprarenal Bodies.—Normal.

Tongue, *Tonsils*, *Larynx*, *Pharynx*, and *Trachea.*—Normal.

Submaxillary Glands.—In a left submaxillary gland there were a few minute opaque tubercles.

Right Submaxillary Gland.—Normal.

Cervical Glands.—A left cervical gland contained a few minute opaque tubercles. Other cervical glands appeared normal.

Posterior Pharyngeal Glands.—Normal.

RHESUS MONKEY 170. Virus E. IV.

Subcutaneous inoculation of culture derived from the original material through a guinea-pig.

Dose—1 milligramme.

Date of Inoculation—May 15, 1907.

Died—June 8, 1907. [24 days after inoculation.]

Clinical History.

The monkey was not a strong animal and it gradually failed without definite symptoms.

POST-MORTEM EXAMINATION.

The animal was thin without subcutaneous fat but there was no obvious cause of death.

Local Lesion.—In the subcutaneous tissue of the back there was a nodule the size of a broad bean, composed of grey tissue filled with muco-pus ; it was slightly adherent to the skin.

Axillary Glands.—Normal.

Lungs.—The lungs showed the pneumonyssus ; there was no sign of tuberculosis.

Liver.—The liver contained a few cysts filled with clear fluid.

All other organs and glands appeared normal.

RHESUS MONKEY 182. Virus E. IV.

Fed once with culture derived from the original material through a guinea-pig.

Dose—1·0 milligramme.

Date of Inoculation—September 17, 1907.

Killed—October 13th, 1908. [392 days after inoculation.]

Clinical History.

The animal became thin and ill soon after the inoculation; its respirations were rapid and jerky. The culture was administered with a pipette and it was considered possible that some had been inhaled. It slowly recovered, breathed normally and ate well. On July 1, 1908, an enlarged gland was noticed on the right side of the neck; this burst and was evacuated. A year after the inoculation the animal had diminished rather than increased in size; it was thin and not active. The sternum at the lower end projected and the thorax was flattened from side to side (probably from the crouching position constantly assumed). When the animal was killed the eyelids and face were oedematous but there was no obvious difference in general condition.

Tuberculin Test.

January 31, 1908. 136 days after the experiment began. Dose of tuberculin (bovine) 0·4 cc. Rise of temperature 0·6° Centigrade.

POST-MORTEM EXAMINATION.

Tongue, Tonsils, Larynx Pharynx, and Trachea.—Normal.

Submaxillary Glands.—Normal.

In the middle of the neck on the right side, partly covered by the sterno-mastoid, there was a nodule the size of an almond which on section was composed of brownish granulation tissue, with an outer covering of fibrous tissue and containing yellow caseo-purulent nodules.

Abdomen.

Intestines.—Normal.

Mesenteric Glands.—The mesenteric glands were very small and contained no tubercles.

Spleen.—Normal.

Liver.—The liver contained in its substance four cystic nodules the largest the size of a sparrow's egg which on section consisted of thin fibrous walls and central cavities filled with yellow caseo-pus; in two cases the pus bile-stained.

Kidneys.—In the right kidney there were three opaque tubercles with grey margins, up to a rape seed in size. In the left there were four irregular grey foci surrounded by well-marked zones of congestion.

Suprarenal Bodies.—Normal.

A gland in the hilum of the spleen contained a caseous nodule.

Lumbar and Iliac Glands.—Normal.

Thorax.

Lungs.—The lungs collapsed well; they were a little emphysematous around the margins. Just beneath the pleura on both sides could be seen scattered perfectly translucent tubercles.

Bronchial Glands.—Two bronchial glands above and below the bronchus on the right side were enlarged and partly replaced by softening caseous nodules.

A gland within the bifurcation of the trachea was firm and beset with opaque foci, and contained a single soft nodule.

Heart.—Normal.

Axillary Glands.—Normal.

Tubercle bacilli were found in smear preparations made from the bronchial gland and liver nodule.

RHESUS MONKEY 178. Virus E. IV.

Subcutaneous inoculation of culture derived from the original material through a guinea-pig.

Dose—1·0 milligramme.

Date of Inoculation—September 17, 1907.

Died—December 15, 1907. [89 days after inoculation.]

POST-MORTEM EXAMINATION.

Local Lesion.—At the seat of inoculation over the left scapula there was a soft fluctuating tumour, measuring 6 by 4·5 by 3 cm. About the centre of the tumour the skin was reddened and thinned, and there was a small opening, 3 mm. in diameter, from which creamy pus was exuding. On section the fibrous walls were adherent to, but not apparently infiltrating, the muscle. In the centre there was a cavity filled with softening caseous substance, and the walls were lined by shaggy caseous masses.

Axillary Glands.—The axillary glands on the left side were slightly enlarged, and showed yellowish caseous nodules in the cortices.

One right axillary and one right inguinal gland each showed a small opaque focus.

Other inguinal and axillary glands were normal.

Thorax.

Lungs.—The lungs were pink and crepitant; they showed on the surface beneath the pleura a few small hard pearly-grey tubercles up to a millet seed, the largest having a minute opaque centre.

Bronchial Glands.—Normal.

Abdomen.

Mesenteric Glands.—The mesenteric glands showed small irregular caseous nodules.

Spleen.—The spleen was enlarged and measured 4·5 by 3 by 1·5 cm. The surface was normal. On section the pulp was closely filled with yellow softening caseous nodules up to 2·5 mm. in diameter.

Liver.—The liver showed on the surface a moderate number of yellowish opaque tubercles with grey margins, the size of millet seed. Similar tubercles were seen sparsely scattered throughout the substance.

Portal Glands.—The portal glands were extensively replaced by soft yellow caseous tubercles in the cortices.

Kidneys.—The right kidney showed four greyish opaque tubercles the size of rape seed.

The left kidney was normal.

Suprarenal Bodies.—Normal.

There were some loose congested vegetations on the dura mater and one hard congested millet-seed sized nodule on the pia mater with an opaque centre.

There was no tuberculosis elsewhere.

There was a large amount of oedema around the lower jaw.

Microscopical Examinations.

(Smear preparations.)

Spleen.—Numerous tubercle bacilli.

Dura mater (vegetation).—Moderately numerous tubercle bacilli.

Pia mater (nodule).—Very numerous tubercle bacilli.

Mesenteric Gland.—Numerous tubercle bacilli.

CALF 620. Virus E. IV.

Subcutaneous inoculation with culture derived from the original material through a guinea-pig.

Dose—50·0 milligrammes.

Date of Inoculation—March 11, 1908. [Age 10 weeks.]

Killed when in good general health—June 10, 1908. [91 days after inoculation.]

Temperature.

The temperature was normal during the experiment.

Weights.

	kilos.
March 11, 1908	82·08
June 10, 1908	89·33

Gain in weight—7·25 kilos.

POST-MORTEM EXAMINATION.

Carcass in fair condition.

Local Lesion.—At the seat of inoculation on the left side of the neck there was an oval somewhat prominent tumour measuring 9 by 6 by 4 cm. The skin over it was intact and on section it was found to be a cyst, with fibrous walls crossed by fibrous trabeculae, and filled with curdy caseous substance and serous fluid.

Prescapular Glands.—The left prescapular gland measured 9 by 4 by 4·5 cm. On section it was almost entirely replaced by two caseous masses which were breaking down centrally with the formation of curdy caseous flakes in a light yellowish fluid.

The right prescapular gland measured 5·9 by 2·3 by 1·3 cm. On section it was normal.

Prepectoral Glands.—The left prepectoral gland measuring 2·2 by 1·5 cm. was on section rather more than half replaced by a softening yellow caseous substance. The other prepectoral glands were normal.

Cervical Glands.—The left inferior cervical gland was round, measuring 1·2 cm. in diameter. On section the central portion was replaced by softening yellow caseous substance which could be shelled out leaving a thin margin of normal cortex.

The left middle, left axillary, and right superior cervical glands each contained a soft yellow nodule.

Other cervical glands were normal.

Right axillary gland normal.

Thorax.

Pleura.—Normal.

Lungs.—The lungs were pink and crepitant and normal.

Thoracic Lymphatic Glands.—The caudal mediastinal gland measured 8 by 2·5 cm. On section it contained about half-a-dozen soft yellow tubercles up to a millet seed which shelled out completely.

Each of two other mediastinal glands contained a single similar nodule the largest the size of a hemp seed.

The left bronchial gland contained a few minute irregular opaque foci and one soft yellow tubercle.

The right bronchial gland was normal.

Heart.—Normal.

Abdomen.

Peritoneum.—Normal.

Omentum.—On the omentum there were nine loosely attached quite translucent fibrous nodules the largest 2·5 mm. in diameter

Intestine.—The Peyer's patches of the small intestine showed in about half their number from one to six yellow nodules, the largest measuring 4 mm. in diameter. The mucous membrane was normal.

Large Intestine.—Normal.

Mesenteric Glands.—All the mesenteric glands contained yellow caseous nodules; in some they had become confluent, and replaced a considerable part of the cortices; in others they were less numerous and discrete. Almost all were in process of softening and could be easily shelled out, leaving normal looking gland tissue.

Spleen.—The spleen weighed 226 grammes. On the surface there were four small congested fibrous thickenings of the capsule with fibrinous tufts attached; superficially they resembled flattened fibrous tubercles. On section the substance was normal.

Liver.—Normal.

Gall Bladder.—Normal.

Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—The left contained two grey miliary tubercles with caseous centres.

The right contained three slightly larger similar tubercles.

Various Lymphatic Glands.

The cortices of the coeliac glands showed in one case moderately numerous softening caseous tubercles with translucent margins and a few in the other glands.

Each iliac and lumbar gland contained from one to three soft yellow nodules varying up to a hemp seed in size.

The Left Parotid Gland contained a single yellow nodule, and the right several, varying up to a small pea in size.

The Submaxillary Glands contained a few soft yellow nodules, superficial and easily shelling out.

The Retro-pharyngeal Gland resembled the submaxillary.

The Right Popliteal Gland contained an opaque focus and a soft yellow tubercle.

The Left Popliteal, Precrural, Pudic, and two glands at entrance to thorax were normal.

Tongue, Tonsils, Larynx and Pharynx.—Normal.

Testes.—Normal.

Microscopical Examinations.

(Smear preparations.)

Prescapular Gland (emulsion).—Moderately numerous tubercle bacilli.

Parotid Gland (emulsion).—A few tubercle bacilli.

Suprarenal Body (tubercle).—Moderately numerous tubercle bacilli.

Iliac Gland (nodule). — Moderately numerous tubercle bacilli.

Mesenteric Gland (nodule).—Moderately numerous tubercle bacilli.

CALF 616. Virus E. IV.

Subcutaneous inoculation with culture derived from the original material through a guinea-pig.

Dose—50 milligrammes.

Date of Inoculation—March 11, 1908. [Age 10 weeks.]

Killed when in good general health—June 19, 1908. [100 days after inoculation.]

Clinical History.

There was no sign of ill-health during the experiment.

Temperature.

Temperature remained normal during the experiment.

Weights.

	kilos.
March 11, 1908	48·97
June 19, 1908	60·76

Gain in weight.—11·79 kilos.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—In the subcutaneous tissue on the left side of the neck there was a slightly prominent tumour measuring 4·7 by 4·2 cm.; the skin over it was intact.

On section it was found to consist of greyish granulation tissue infiltrated with softening caseous substance. In the centre a small cavity was present.

Prescapular Glands.—The left prescapular gland measured 5·4 by 3·3 by 1·8 cm. On section rather more than half the cortex was replaced by two caseous masses, in parts pinkish, necrotic and gritty, in parts soft yellow and caseo-purulent.

The right prescapular gland measured 4·3 by 1·7 by 1 cm. On section it was normal.

Prepectoral Glands.—Normal.

Cervical Glands.—The left inferior cervical gland was about the size of a sparrow's egg. On section it contained a central core of softening caseous substance which easily shelled out.

In the left superior cervical gland there was a yellow caseo-purulent nodule the size of a hemp seed.

The other cervical glands were normal.

Mesenteric Glands.—About a third of the total number of mesenteric glands contained from one to three soft opaque yellowish foci, up to about a rape seed in size.

All organs and other lymphatic glands showed no tuberculosis.

Microscopical Examinations.

(Smear preparations.)

Prescapular Gland.—Numerous tubercle bacilli.

Left Superior Cervical Gland.—A moderate number of tubercle bacilli.

Mesenteric Gland.—Numerous tubercle bacilli.

PONY 22. Virus E. IV.

Subcutaneous inoculation with culture derived from the original material through a guinea-pig.

Dose—50 milligrammes.

Date of Inoculation—March 11, 1908. [Age—yearling.]

Killed when ill—July 14, 1908. [125 days after the inoculation.]

Clinical History.

The skin at the seat of the inoculation quickly ulcerated. A large prominent tumour was slowly formed in the region of the prescapular glands. The animal gradually became thinner with a rough dirty coat and breathed rapidly and jerkily. When killed it was very ill but not in a dying condition and its appetite was very feeble.

Temperature.

The temperature remained normal during the experiment.

Tuberculin Test.

May 13, 1908. [63 days after the experiment began.] Dose of tuberculin (bovine) 3·0 cc. Rise of temperature 1·1° Centigrade.

Weights.

	kilos.
March 11, 1908	102·49
July 14, 1908	99·31

Loss in weight.—318 kilos.

POST-MORTEM EXAMINATION.

General condition poor.

Local Lesion.—In the skin at the seat of inoculation on the left side of the neck there was an oval ulcer measuring 6 by 3·5 cm. with undermined margins and a smooth floor of greyish granulation tissue. Beneath the ulcer was a slightly prominent tumour measuring 8 by 5 by 2·5 cm. On section the base of the ulcer consisted of firm fibrous tissue and the underlying tumour was composed of a softer translucent tissue showing some sparsely scattered soft caseous miliary nodules.

Prescapular Glands.—The left prescapular glands formed a prominent tumour weighing with the skin and muscle 1·58 kilos and measuring 20 by 19 by 10 cm. In the skin over the centre of the tumour there was a small hole at the bottom of a depression from which issued yellow muco-pus. On section the tumour consisted of a mass of pinkish grey semi-translucent tissue with fine trabeculae of white fibrous tissue. It resembled the local tumour and was similarly beset with soft yellow caseous nodules up to a thrush's egg in size. At the deeper part of the tumour individual glands could be seen embedded in the tissue just described and containing masses of softening caseous-necrotic substance.

Adherent to the deeper part of the mass near the glands just mentioned there was a second tumour measuring 9 by 6 by 3·5 cm. It consisted of the enlarged inferior cervical glands, and on section was composed of yellowish-grey firm tissue with sparsely scattered caseous streaks and foci.

On the left side, just within the entrance to the thorax, there was a mass of enlarged glands continuous with the cervical glands; on section they consisted of translucent tissue beset with soft yellow caseous nodules.

The cervical glands on the left side were all enlarged and formed a continuous chain the whole length of the neck. On section they consisted of firm greyish-white tissue in which an occasional opaque caseous focus could be seen.

In the middle of the neck they were largest (just beneath the local tumour), and contained a soft yellow caseous mass in the centre.

In the superior cervical glands, which shared in the enlargement, there was one partly caseous and softened. A mass of deep glands on each side of the pharynx (retro-pharyngeal) contained numerous caseous nodules and areas up to about a wheat grain in size: the majority were small and rather indefinite; the largest were softened.

The right prescapular glands and lower cervical glands were enlarged and contained soft yellow caseous patches; these were the more numerous in the prescapular glands.

Axillary Glands.—In a left axillary gland there were discrete minute translucent tubercles.

In a right axillary gland there was a softening yellow caseous nodule.

Thorax.

Diaphragm.—On the pleural surface of the diaphragm there were a few loosely attached fibrous nodules.

Lungs.—The lungs were heavy and did not collapse normally. On section the caudal halves of both lungs were closely filled with a network of confluent grey translucent nodules. The nodules became less numerous and more discrete towards the middle of the lung. In the anterior halves, except for a margin along the dorsum, there were discrete minute translucent tubercles.

Bronchial Glands.—The bronchial glands were enlarged, firm, reddish-white in colour, but showed no caseation.

Heart.—In the heart muscle, visible beneath the endocardium, were two homogeneous fibrous nodules, the largest a centimetre in diameter.

Abdomen.

Omentum.—Normal.

Colic Glands.—The very numerous colic glands were enlarged and resembled the mesenteric glands.

Mesenteric Glands.—The mesenteric glands were considerably enlarged and firm. On section they showed in the cortices fairly numerous bright yellow caseous streaks and patches, many of which were softened.

Spleen.—The spleen weighed 311 grammes. On the surface projecting above it, but beneath the capsule and chiefly in the margins, could be seen about twenty nodules which on section were composed of grey translucent tissue quite homogenous but not hard. On section through the pulp the Malpighian bodies were a little prominent, and there were scattered grey translucent nodules varying up to a hemp seed in size. In two of the nodules the centres were yellow and caseous.

The glands in the hilum of the spleen were enlarged and firm, and contained a few soft caseous nodules up to a millet seed in size.

Liver.—On the convex surface there were three loosely attached greyish-white nodules. On the concave surface there was a group of similar nodules the largest 5 mm. in diameter, also a second group containing about twenty flattened nodules, some of which were loosely attached. On section through the substance of the liver there was considerable fibrous thickening of the bile ducts which being cut in various planes gave the liver the appearance of containing a network and nodules of whitish fibrous tissue. No definite tuberculous nodules could be seen.

Portal Glands.—Normal.

Kidneys.—On the surface beneath the capsule there were scattered ill-defined grey translucent nodules up to about 4 mm. in diameter. They were palpable, and one or two were slightly raised above the surface. On section they extended into the cortices in a wedge-shaped manner. In the pyramid of the right kidney there was a grey miliary tubercle with a yellow centre.

Suprarenal Bodies.—Normal.

Tonsils.—In the tonsils, which were prominent, there were several collections of soft yellow caseous substance.

The epiglottis and the aryteno-epiglottidean folds were closely studded with grey translucent submiliary nodules. The glandular tissue at the root of the tongue was congested and hypertrophied.

Various Lymphatic Glands.

A Coeliac Gland was firm and showed an opaque focus.

Lumbar and Iliac Glands were normal.

The Pudic and Precrural Glands contained discrete yellowish-white caseous patches.

In a *Left Popliteal Gland* there was a caseous focus.

Microscopical Examinations.

(Smear preparations.)

Lung (emulsion).—A moderate number of tubercle bacilli.

Heart (nodule).—Numerous tubercle bacilli.

Gland at entrance to Thorax	Very numerous tubercle bacilli.
Right Deep Cervical Gland	
Left Axillary Gland	
Pudic Gland	
Right Prescapular Gland	
Tonsil (caseous patch)	

PONY 24. Virus E. IV.

Intravenous (partly subcutaneous) inoculation with culture derived from the original material through a guinea-pig.

Dose—10 milligrammes.

Date of Inoculation—March 11, 1908. [Age—Yearling.]

Died—June 17, 1908. [98 days after the experiment began.]

Temperature.

The temperature rose to 39·7 on the 24th day. It fell and remained about 39·0° C. for 9 days, after which it slowly rose attaining the maximum of 40·0° C. on the 41st day. There was subsequently a very gradual fall to 39·0 and again a rise to 39·9° C. The last rise was maintained only for a few days after which the temperature fell reaching 37·8° C. just before death.

Weights.

	kilos.
March 11, 1908	95·23
June 17, 1908	62·12

Loss in weight.—33·11 kilos.

POST-MORTEM EXAMINATION.

Carcass emaciated.

Local Lesion.—In the skin on the left side of the neck extending to the middle line there was an oval ulcer measuring 4 by 3 cm. with a dark necrotic base. On section there was found beginning at the base a sinus, which would admit a finger, leading to the left prescapular glands. Its walls were greenish-black, necrotic and foul smelling; it contained some loose masses of yellowish softening caseous substance.

Prescapular Glands.—The left prescapular glands were enlarged, adherent, and on section were composed of yellow caseous substance in a translucent matrix. The prescapular chain of glands was continuous with the cervical chain.

Several of the other prescapular glands contained single caseous miliary tubercles.

Cervical Glands.—The left cervical glands were enlarged and adherent, and on section resembled the prescapular glands.

There was an opaque focus in each of two right lower cervical glands.

Two glands in the middle of the neck on the right side were caseous throughout and there was a mass of enlarged caseous glands at the junction of the upper two-thirds and the lower third of the neck.

A gland just within the thorax contained a single yellowish nodule softening in the centre, the size of a hemp seed.

Thorax.

Lungs.—The lungs were voluminous and heavy but still air-containing, except for the anterior inferior portion of the right lobe which was reddish-grey and solid and sank in water. On section the lung parenchyma was closely filled with minute tubercles which were quite transparent, except for an occasional one about the size of a millet seed which had an opaque caseous centre.

Thoracic Lymphatic Glands.—The bronchial and mediastinal glands were congested in parts and were perhaps a little firmer than normal. On section there were one or two ill defined yellow caseating patches in the cortices.

Abdomen.

Omentum.—In the omentum there were three translucent fibrous nodules, the largest the size of a hemp seed.

Peritoneum.—There were numerous worms beneath the ventral portion of parietal peritoneum and the tissues around were dark and congested.

A mesenteric artery was thickened and contained yellow necrotic substance in the wall (parasitic).

The mesentery and mesenteric glands were congested but the latter showed no caseation.

Intestines.—Beneath the mucous membrane of the small intestine there were two purulent nodules.

Spleen.—The spleen weighed 169 grammes. On section the substance was normal.

Liver.—The liver substance was dark and congested, and decomposition was quickly setting in. In the centre there were two firm yellow necrotic nodules.

Portal Glands.—The portal glands, several of which were slightly enlarged, showed ill-defined yellow necrotic areas in the cortices.

Kidneys.—In the cortex of the right kidney there was a wedge shaped lemon-yellow necrotic nodule, the base measuring 1 cm. in diameter, showing beneath the capsule. In the rest of the kidney there were a few sparsely scattered grey necrotic foci. On section through the substance there were several necrotic nodules similar to, but smaller than the one first described; they were situated both in the cortex and in the pyramids, and some were surrounded by a zone of congestion. In the left kidney there were some scattered foci and a few pigmented patches but no necrotic nodules.

Suprarenal Bodies.—Normal.

Other organs and lymphatic glands were normal.

Microscopical Examination.

(Smear preparations.)

Lung.—A moderate number of tubercle bacilli.

Bronchial Gland (caseous patch).—Numerous tubercle bacilli.

Bronchial Gland (cortex).—Moderately numerous tubercle bacilli.

Spleen (substance).—One tubercle bacillus.

Liver (nodule).—Moderately numerous tubercle bacilli.

Kidney (nodule) } No tubercle bacilli.
„ (substance) }

Portal Gland.—Numerous tubercle bacilli.

Omentum (nodule).—A few scattered tubercle bacilli.

Intestinal nodule.—No tubercle bacilli.

RHESUS MONKEY 218. Virus E. IV.

Subcutaneous inoculation with culture derived from the original material through a guinea-pig

Dose—1·0 milligramme.

Date of Inoculation—July 23, 1908.

Killed when in good general health—October 26, 1908. [95 days after inoculation.]

Clinical History.

The animal beyond being somewhat pale had shown no signs of ill health.

POST-MORTEM EXAMINATION.

General condition. When killed, the body was in good condition and there was fat both in the omentum and the subcutaneous tissues.

Local Lesion.—In the skin of the back a little to the left of the middle line there was a shallow irregular ulcer, 1·7 by 1 cm., with a congested floor studded with caseous foci. In the subcutaneous tissue beneath and around, in an area roughly 4 cm. in diameter, there was a number of softening caseous nodules embedded in cicatritial tissue.

Axillary Glands.—Three left axillary glands were enlarged. The largest, the size of a sparrow's egg, was replaced by soft yellow caseous substance; the other two contained caseo-purulent nodules. Three right axillary glands were enlarged. The largest, 1·2 by 1 cm., contained several soft caseous nodules; of the other two, one showed a few opaque foci.

A cervical gland just above the right clavicle contained a few soft yellow tubercles up to a millet seed in size.

Thorax.

Lungs.—The lungs were crepitant and contained a moderate number of grey tubercles with caseous centres, varying up to about a millet seed in size.

Bronchial Glands.—Normal.

A manubrial gland on the right side was enlarged, caseous and softened throughout; the left were normal.

Three vertebral glands on each side contained caseous nodules; those on the left were the most enlarged

Abdomen.

Omentum.—In the omentum there was a single caseous nodule the size of a hemp seed.

Intestines.—The small intestine was normal.

They were a few congested ulcers in the large intestine.

Mesenteric Glands.—Two mesenteric glands were slightly enlarged, and partly caseous and softened. The rest were normal.

Coeliac Glands.—Two coeliac glands were beset with caseous foci beneath the capsules.

Spleen.—The spleen was irregular in outline from the presence of numerous soft yellow nodules, in parts confluent. On section the pulp was closely beset with similar nodules.

Liver.—The liver was enlarged and showed numerous discrete minute grey foci and occasional soft caseous tubercles, varying in size up to a millet seed.

Portal Glands.—There were a few opaque foci in one portal gland.

Kidneys.—The right kidney showed in the cortex three opaque yellow submiliary tubercles. The left contained only one.

Suprarenal Bodies.—Normal.

Lumbar and Iliac Glands.—Normal.

Testes.—Normal.

Brain.—In the substance of the brain just beneath the pia mater there were nine soft yellow nodules, varying in size up to 3·5 mm. in diameter.

MONKEY 210. Virus E. IV.

Fed with culture derived from the original material through a guinea-pig.

Dose—50 milligrammes. [Single feeding with culture in milk.]

Date—April 10, 1908.

Killed when dying—June 26, 1908. [77 days after feeding.]

Clinical Notes.

The monkey was well up to June 11, 1908, when it had diarrhœa and passed a little bright red blood in the faeces. Its appetite failed and it lost flesh. The diarrhœa continued, and the animal became weaker until it was finally killed in a dying condition.

POST-MORTEM EXAMINATION.

Small Intestine.—The Peyer's patches were not enlarged, but without exception showed small flat ulcers and small soft caseous patches which formed the bases of the ulcers.

The solitary follicles were a little prominent and showed fine capillary congestion in the mucous membrane over them, while from the peritoneal surface they appeared greyish-white.

Large Intestine.—The mucous membrane was congested and oedematous, and in a polypoid condition. There were also numerous irregular ulcers, many congested and surrounded by prominent oedematous mucous membrane.

Mesenteric Glands.—The glands in the centre of the mesentery were enlarged. On one side there was a mass 3·5 by 1·5 by ·8 cm., of which, on section, the cortical portion to a great extent consisted of soft yellowish caseous substance which easily shelled out, and nodules of similar substance. The mass on the other side of the mesentery was about half the size and was apparently composed of three glands; there was a margin of caseous substance around the cortices and also nodules of soft caseous substance.

Colic Glands.—Normal.

Lungs.—In the anterior lobe of the left lung there was a soft caseous miliary tubercle within a thin translucent capsule. The lung parenchyma was oedematous, but otherwise normal.

There was no tuberculosis elsewhere in the body.

Microscopical Examinations.

(Smear preparations.)

Lung (tubercle).—Numerous tubercle bacilli.

Small Intestine (follicle).—Very numerous tubercle bacilli in clumps.

Large Intestine (ulcer).—A few clumps of T.B. and numerous blue staining organisms.

VIRUS E. V.

TISSUE EMULSION INOCULATIONS (ORIGINAL MATERIAL.)

MAY 17, 1907.

Inoculations of emulsions made from the original material into rabbits and guinea-pigs.

RABBITS.

—	Number.	Method.	Duration of Life.	Result.
Emulsion of lung.	1341	Subcut.	D. 36 days	G. T.
Emulsion of spleen.	1342	Intrap.	K. 61 „	G. T.
	1343	Subcut.	D. 40 „	G. T.
Emulsion of mesenteric gland.	1344	Intrap.	D. 22 „	G. T.
	1345	Subcut.	D. 45 „	G T.

GUINEA-PIGS.

—	Number.	Method.	Duration of Life.	Result.
Emulsion of lung.	2495	Subcut.	D. 27 days	G. T.
Emulsion of spleen.	2496	Intrap.	D. 7 „	Early T.
	2497	Subcut.	D. 28 „	G. T.
Emulsion of mesenteric gland.	2498	Intrap.	D. 12 „	Acute T.
	2499	Subcut.	K. 32 „	G. T.

CULTURE INOCULATIONS.

SEPTEMBER 9, 1907

The strain was derived from an equine lung and had been 116 days in artificial cultivation.

The culture used was the 5th generation, 21 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1444	Intrav.	1·0 mg.	D. 16 days	G. T.
1446	Intrav.	0·1 mg.	D. 18 „	G. T.
1445	Subcut.	10·0 mg.	D. 34 „	G. T.
1443	Subcut.	10·0 mg.	D. 45 „	G. T.
1442	Subcut.	1·0 mg.	D. 53 „	G. T.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2610	Intrap.	0·1 mg.	D. 18 days	Acute T.
2609	Subcut.	0·1 mg.	D. 75 „	G. T.

PART II.

PASSAGE EXPERIMENTS.

(i). Tabular Summaries of inoculation experiments with the Passage Cultures of Viruses E II. and E IV.

(ii). Descriptive Charts of the Experiments with Viruses E II. and E IV., and Full Post-mortem Notes on the larger experimental animals.

TABULAR SUMMARY OF INOCULATION EXPERIMENTS ON CALVES WITH CULTURES OF EQUINE TUBERCLE BACILLI AFTER PASSAGE.

All Subcutaneous.

Virus.	Source of Culture.	Total Age of Culture: Age and Generation of Sub-culture Inoculated.	Dose.	Date of Inoculation.	Number of Calf.	Weight in Kilos.		Duration of Life.	Result.
						Initial.	Final.		
E. II.	Prescapular gland of Calf 404	564 days 21 days old, 10th generation	50·0 mg.	Feb. 12, 1908	590	41·26	39·45	Died 7 days	Death due to chronic diarrhoea and purulent broncho-pneumonia.
,,	Spleen of Calf 590	70 days 21 days old, 3rd generation	50·0 mg.	April 29, 1908	618	38·54	58·49	Killed 84 days	Local tuberculosis only.
,,	Prescapular gland of Calf 404	564 days 21 days old, 10th generation	50·0 mg.	Feb. 12, 1908	598	50·79	70·29	Killed 91 days	Local tuberculosis. A few foci in the liver and in one iliac gland.
,,	Prescapular gland of Calf 598	16 days 2 days old, 3rd generation	50·0 mg.	May 29, 1908	640	53·96	92·06	Killed 95 days	Local tuberculosis and slight generalised tuberculosis.
,,	Prescapular gland of Calf 406	568 days 17 days old, 10th generation	50·0 mg.	Feb. 18, 1908	596	53·96	63·49	Killed 90 days	Local tuberculosis and slight generalised tuberculosis.
,,	Lung of Calf 596	23 days 4 days old, 3rd generation	50·0 mg.	June 10, 1908	638	50·79	42·62	Killed (when ill) 40 days	General tuberculosis.
,,	Prescapular gland of Calf 406	568 days 17 days old, 10th generation	50·0 mg.	Feb. 18, 1908	600	53·96	61·21	Killed 136 days	Local tuberculosis. A few foci in the liver and in a lumbar gland.
,,	Prescapular gland of Calf 600	32 days 14 days old, 3rd generation	50·0 mg.	Aug. 4, 1908	648	103·39	160·08	Killed 83 days	Local tuberculosis and a few opacities in the Malpighian bodies of spleen.
,,	Lung of Calf 504	264 days 21 days old, 3rd generation	50·0 mg.	Jan. 29, 1908	578	68·02	67·11	Killed 90 days	Slight retrogressive general tuberculosis.
,,	,,	,, ,,	50·0 mg.	,,	580	41·72	33·55	Died 29 days	General tuberculosis.
,,	Prescapular gland of Calf 504	329 days 21 days old, 4th generation	50·0 mg.	April 3, 1908	626	50·79	42·62	Died 54 days	General tuberculosis.
,,	Lung of Calf 506	330 days 23 days old, 16th generation	50·0 mg.	,,	628	62·19	65·30	Killed 90 days	Slight general tuberculosis.
,,	Lung of Calf 628	33 days 14 days old, 3rd generation	50·0 mg.	Aug. 4, 1908	646	79·81	65·30	Died 33 days	General tuberculosis.
,,	Lung of Calf 506	285 days 17 days old, 11th generation	50·0 mg.	Feb. 18, 1908	594	58·50	51·69	Died 16 days	Early general tuberculosis. Death due to broncho-pneumonia.
,,	Diaphragm of Rabbit 1330	97 days 21 days old, 4th generation	50·0 mg.	May 11, 1908	632	53·51	48·07	Died 38 days	General tuberculosis.
E. IV.	Prescapular gland of Calf 408	531 days 19 days old, 14th generation	50·0 mg.	Jan. 30, 1908	582	48·62	47·71	Killed 88 days	Local tuberculosis and slight generalised tuberculosis.
,,	Spleen of Calf 582	28 days 9 days old, 3rd generation	50·0 mg.	May 25, 1908	636	58·49	95·68	Killed 98 days	Local tuberculosis. Tubercles in thoracic and abdominal lymphatic glands. A tubercle in the spleen and in the kidney.
,,	Prescapular gland of Calf 408.	531 days 19 days old, 14th generation	50·0 mg.	Jan. 30, 1908	584	55·32	69·83	Killed 98 days	Local tuberculosis and a few foci in liver, kidneys, and thoracic glands. Miliary tubercles in the suprarenal bodies.
,,	Suprarenal body of Calf 584	22 days 4 days old, 3rd generation	50·0 mg.	May 29, 1908	642	49·42	100·67	Killed 96 days	Local tuberculosis. A few opaque foci in the spleen, in a mediastinal gland, and in a few mesenteric glands Two nodules in each suprarenal body.

,,	Lung of Calf 498	282 days 21 days old, 4th generation	50·0 mg.	Feb. 5, 1908	586	58·95	53·51	Died 36 days	Slight tuberculosis. Death from non-tuberculous broncho-pneumonia.
,,	Mediastinal gland of Calf 586	104 days 10 days old, 4th generation	50·0 mg.	May 19, 1908	634	45·80	86·61	Killed 104 days	Local tuberculosis. A few foci in the liver and portal glands.
,,	Lung of Calf 498	282 days 21 days old, 4th generation	50·0 mg.	Feb. 5, 1908	588	71·64	68·47	Killed 90 days	Local tuberculosis only.
,,	Prescapular gland of Calf 588	24 days 8 days old, 3rd generation	50·0 mg.	May 29, 1908	644	52·15	77·54	Killed 95 days	Local tuberculosis and very slight disseminated tuberculosis.
,,	Suprarenal body of Calf 502	243 days 22 days old, 5th generation	50·0 mg.	April 7, 1908	602	46·71	69·83	Killed 90 days	General tuberculosis. Not severe, but apparently progressing.
,,	Mediastinal gland of Calf 602	30 days 9 days old, 3rd generation	50·0 mg.	Aug. 5, 1908	650	66·66	52·60	Died 39 days	General tuberculosis.
,,	Lung of Calf 502	373 days 19 days old, 4th generation	50·0 mg.	May 7, 1908	614	33·55	30·38	Died 33 days	Early general tuberculosis. Death hastened by broncho-pneumonia.
,,	,,	,, ,,	50·0 mg.	,,	630	35·82	29·02	Died 31 days	General tuberculosis.
,,	Mesenteric gland of Baboon 74.	76 days 20 days old, 5th generation	50·0 mg.	April 28, 1908	604	43·53	77·09	Killed 91 days	Local tuberculosis. Three tubercles in liver and four nodules in the mesenteric glands. No tuberculosis elsewhere.
,,	,,	,, ,,	50·0 mg.	,,	612	39·90	66·66	Killed 91 days	Local tuberculosis. A small nodule in the lung, one in a bronchial gland and five in the spleen.

INOCULATION EXPERIMENTS ON MONKEYS WITH CULTURES OF EQUINE TUBERCLE BACILLI AFTER PASSAGE.

Virus.	Source of Culture.	Total Age of Culture: Age and Generation of Sub-culture Inoculated.	Dose.	Date of Inoculation.	Number of Animal.	Method of Inoculation.	Duration of Life.	Result.
E. II.	Prescapular gland of Calf 404	354 days 21 days old, 5th generation	50·0 mg. (10·0 mg. per day)	April 8, 1908	Monkey 212	Fed	Died 82 days	Very slight tuberculosis. Death due to non-tuberculous ulceration of the large intestine.
,,	Lung of Calf 506	330 days 23 days old, 16th generation	50·0 mg. (10·0 mg. per day)	April 3, 1908	Monkey 206	,,	Killed (dying) 38 days	General tuberculosis. Intestinal tuberculosis severe.
E. IV.	Prescapular gland of Calf 408	706 days 23 days old, 11th generation	1·0 mg.	,,	Monkey 220	Subcutaneous	Killed 96 days	General tuberculosis. Moderately severe.
,,	Lung of Calf 502	450 days 23 days old, 5th generation	1·0 mg.	,,	Monkey 222	,,	Died 33 days	General tuberculosis.

RABBITS INOCULATED WITH CULTURES OF VIRUS E. II. AFTER PASSAGE.

CULTURE FROM THE PRESCAPULAR GLAND OF CALF 404. (*See* Chart, page 105.)

INOCULATED JULY 17, 1907. VIRULENCE FOR CALF NOT INCREASED.

Method of Inoculation.	Dose.	Age and Generation of Subculture Inoculated.	Number of Rabbit.	Weight in Grammes.		Duration of Life.	Result.
				Initial.	Final.		
Intravenous	1·0 mg.	21 days old, 5th generation.	1415	1,150	1,220	Died 24 days.	General tuberculosis.
"	0·1 mg.	"	1414	1,550	1,200	Died 23 days.	General tuberculosis.
Subcutaneous	10·0 mg.	"	1417	2,020	1,530	Died 155 days.	Chronic tuberculosis of lungs, kidneys, bronchial glands and joints resembling that produced by avian tubercle bacilli.
"	1·0 mg.	"	1416	1,770	1,310	Died 128 days.	Chronic tuberculosis of lungs, kidneys, testes, and wrist joints.

CULTURE FROM THE PRESCAPULAR GLAND OF CALF 404. (*See* Chart, page 105.)

INOCULATED FEBRUARY 12, 1908. VIRULENCE FOR CALF NOT INCREASED.

Intravenous	1·0 mg.	21 days old, 10th generation.	1635	2,130	1,570	Died 20 days.	General tuberculosis.
"	0·1 mg.	"	1634	2,950	1,680	Died 106 days.	Tuberculosis of kidneys (pelvis contained pus), and of lungs (moderately severe). Nodules in testes.
"	0·01 mg.	"	1633	2,210	1,080	Died 181 days.	Chronic tuberculosis of lungs, kidneys, left testis, left knee, right ankle, and right hip joints.
Subcutaneous	10·0 mg.	"	1636	2,160	1,600	Killed 204 days.	Caseo-purulent local tumour; six caseous nodules and tubercles in lungs; no tuberculosis elsewhere.
"	10·0 mg.	"	1637	2,180	2,750	Killed 204 days.	Local tuberculosis; two caseous nodules in the lungs, and two in left kidney. No tuberculosis elsewhere.

CULTURE FROM THE SPLEEN OF CALF 590. (*See* Chart, page 105.)

INOCULATED APRIL 29, 1908. VIRULENCE FOR CALF NOT INCREASED.

Intravenous	0·1 mg.	21 days old, 3rd generation.	1756	1,210	1,000	Died 32 days.	General tuberculosis.
"	0·01 mg.	"	1757	1,150	920	Died 119 days.	Chronic general tuberculosis severe in lungs.
Subcutaneous	50·0 mg.	"	1758	1,670	900	Died 112 days.	Local tuberculosis; slight chronic tuberculosis of lungs, kidneys, and bronchial glands.
"	10·0 mg.	"	1759	1,030	870	Died 145 days.	Local tuberculosis; chronic tuberculosis of lungs, kidneys, and bronchial glands.

CULTURE FROM THE PRESCAPULAR GLAND OF CALF 618. (*See* Chart, page 105.)

INOCULATED AUGUST 6, 1908. FINAL CALF IN PASSAGE.

Intravenous	1·0 mg.	6 days old, 2nd generation.	1894	1,150	800	Died 17 days.	General tuberculosis.
"	0·1 mg.	"	1893	1,130	670	Died 35 days.	General tuberculosis.
Subcutaneous	10·0 mg.	"	1895	1,030	850	Died 92 days	General tuberculosis.
"	10·0 mg.	"	1896	1,090	1,080	Died 64 days.	General progressive tuberculosis; death apparently premature.

CULTURE FROM THE PRESCAPULAR GLAND OF CALF 598. (*See* Chart, page 105.)

INOCULATED MAY 29, 1908. VIRULENCE FOR CALF NOT INCREASED.

Method of Inoculation.	Dose.	Age and Generation of Subculture Inoculated.	Number of Rabbit.	Weight in Grammes.		Duration of Life.	Result.
				Initial.	Final.		
Intravenous	0·1 mg.	2 days old, 3rd generation.	1783	1,750	1,130	Died 27 days.	General tuberculosis.
„	0·01 mg.	„	1784	1,470	770	Died 73 days.	Chronic general tuberculosis; severe in the lungs.
Subcutaneous	10·0 mg.	„	1785	1,270	1,850	Killed 161 days.	Local tuberculosis; slight retrogressive tuberculosis of lungs, kidneys, and a ventral mediastinal gland.
„	10·0 mg.	„	1786	1,070	730	Died 21 days.	Slight tuberculosis; cause of death not obvious.

CULTURE FROM THE MESENTERIC GLAND OF CALF 406. (*See* Chart, page 106.)

INOCULATED FEBRUARY 18, 1908. VIRULENCE FOR CALF SLIGHTLY INCREASED.

Intravenous	1·0 mg.	17 days old, 10th generation.	1663	1,350	790	Died 27 days.	Acute tuberculosis; lesions not developed.
„	0·1 mg.	„	1662	1,200	790	Died 27 days.	General tuberculosis.
„	0·01 mg.	„	1661	1,500	1,000	Died 33 days.	General tuberculosis.
Subcutaneous	10·0 mg.	„	1664	2,000	1,220	Died 115 days.	Chronic tuberculosis of lungs and kidneys (pus in pelves); caseous lesion in spinal cord causing paralysis during life.
„	10·0 mg.	„	1665	1,750	1,550	Killed 188 days.	Local tuberculosis; slight tuberculosis of lungs; several caseous nodules in the mammary glands.

CULTURE FROM THE LUNG OF CALF 596. (*See* Chart, page 106.)

INOCULATED JUNE 10, 1908. VIRULENCE FOR CALF HIGH.

Intravenous	0·1 mg.	4 days old, 3rd generation.	1796	1,390	850	Died 19 days.	General tuberculosis.
„	0·01 mg.	„	1795	1,400	980	Died 30 days.	General tuberculosis.
Subcutaneous	50·0 mg.	„	1798	1,470	1,060	Died 107 days.	General tuberculosis.
„	10·0 mg.	„	1797	1,590	1,200	Died 94 days.	General tuberculosis.

CULTURE FROM THE PRESCAPULAR GLAND OF CALF 600. (*See* Chart, page 106.)

INOCULATED AUGUST 4, 1908. VIRULENCE FOR CALF NOT INCREASED.

Intravenous	0·1 mg.	14 days old, 3rd generation.	1873	2,270	1,350	Died 34 days.	General tuberculosis.
„	0·01 mg.	„	1874	2,090	1,950	Killed 119 days.	Chronic tuberculosis of spleen, lungs, kidneys, joints, and several lymphatic glands.
Subcutaneous	10·0 mg.	„	1871	2,290	2,800	Killed 119 days.	Chronic general tuberculosis, moderately severe in lungs.
„	1·0 mg.	„	1872	2,020	2,500	Killed 119 days.	Cystic local lesion and a single tubercle in each lung. No disease elsewhere.

CULTURE FROM THE LUNG OF CALF 504. (*See* Chart, page 107.)

INOCULATED JULY 23, 1907. VIRULENCE FOR CALF INCREASED.

Intravenous	1·0 mg.	19 days old, 4th generation.	1422	1,940	1,150	Died 15 days.	General tuberculosis.
„	0·1 mg.	„	1423	1,870	1,320	Died 21 days.	General tuberculosis.
Subcutaneous	10·0 mg.	„	1424	970	830	Died 50 days.	General tuberculosis; death premature.
„	1·0 mg.	„	1425	950	850	Died 23 days.	Early tuberculosis; death from psorospermosis.

CULTURE FROM THE LUNG OF CALF 504. (*See* Chart, page 107.)

INOCULATED JANUARY 29, 1908. VIRULENCE FOR CALF INCREASED.

Method of Inoculation.	Dose.	Age and Generation of Subculture Inoculated.	Number of Rabbit.	Weight in Grammes.		Duration of Life.	Result.
				Initial.	Final.		
Intravenous	1·0 mg.	21 days old, 10th generation.	1614	2,100	1,500	Died 11 days.	General tuberculosis.
,,	0·1 mg.	,,	1613	2,370	1,530	Died 27 days.	General tuberculosis.
,,	0·01 mg.	,,	1612	3,310	1,800	Died 26 days.	General tuberculosis.
Subcutaneous	1·0 mg.	,,	1615	2,350	1,320	Died 58 days.	General tuberculosis.

CULTURE FROM THE LUNG OF CALF 504. (*See* Chart, page 107.)

INOCULATED APRIL 3, 1908. VIRULENCE FOR CALF HIGH.

Intravenous	0·1 mg.	21 days old, 4th generation.	1713	1,420	1,120	Died 13 days.	Early general tuberculosis, death due to diarrhoea.
,,	0·01 mg.	,,	1715	1,720	1,480	Died 101 days.	Chronic retrogressive tuberculosis. Death from purulent pleurisy.
Subcutaneous	10·0 mg.	,,	1714	1,470	830	Died 80 days.	General tuberculosis.
,,	1·0 mg.	,,	1716	1,420	1,000	Died 79 days.	General tuberculosis.

CULTURE FROM THE LUNG OF CALF 506. (*See* Chart, page 108.)

INOCULATED JULY 17, 1907. VIRULENCE FOR CALF INCREASED.

Intravenous	1·0 mg.	21 days old, 4th generation.	1411	1,950	1,450	Died 16 days.	General tuberculosis.
,,	0·1 mg.	,,	1410	2,020	1,400	Died 23 days.	General tuberculosis.
Subcutaneous	10·0 mg.	,,	1413	2,000	1,400	Died 74 days.	General tuberculosis.
,,	1·0 mg.	,,	1412	1,470	950	Died 80 days.	General tuberculosis.

CULTURE FROM THE LUNG OF CALF 506. (*See* Chart, page 108.)

INOCULATED FEBRUARY 18, 1908. VIRULENCE FOR CALF INCREASED.

Intravenous	1·0 mg.	17 days old, 11th generation.	1668	1,950	1,420	Died 17 days.	General tuberculosis.
,,	0·1 mg.	,,	1667	2,200	1,550	Died 26 days.	General tuberculosis.
,,	00·1 mg.	,,	1666	2,050	1,700	Died 30 days.	General tuberculosis.
Subcutaneous	10·0 mg.	,,	1669	1,470	1,020	Died 39 days.	General tuberculosis.
,,	10·0 mg.	,,	1670	2,200	1,700	Died 46 days.	General tuberculosis.

CULTURE FROM THE LUNG OF CALF 506. (*See* Chart, page 108.)

INOCULATED APRIL 3, 1908. VIRULENCE FOR CALF INCREASED.

Intravenous	1·0 mg.	23 days old, 16th generation.	1843	2,220	1,420	Died 15 days.	General tuberculosis.
,,	1·0 mg.	,,	1844	1,890	1,270	Died 20 days.	General tuberculosis

CULTURE FROM THE LUNG OF CALF 628. (*See* Chart, page 108.)

INOCULATED AUGUST 4, 1908. VIRULENCE FOR CALF HIGH.

Intravenous	0·1 mg.	14 days old, 3rd generation.	1869	2,140	1,550	Died 28 days.	General tuberculosis.
,,	0·01 mg.	,,	1870	2,040	1,640	Died 21 days.	General tuberculosis.
Subcutaneous	10·0 mg.	,,	1867	1,450	1,100	Died 83 days.	General tuberculosis.
,,	10·0 mg.	,,	1868	2,230	1,660	Died 49 days.	General tuberculosis.

CULTURE FROM THE DIAPHRAGM OF RABBIT 1330. (*See* Chart, page 109.)
INOCULATED MAY 11, 1908. VIRULENCE FOR CALF HIGH.

Method of Inoculation.	Dose.	Age and Generation of Subculture Inoculated.	Number of Rabbit.	Weight in Grammes.		Duration of Life.	Result.
				Initial.	Final.		
Intravenous	0·1 mg.	21 days old, 4th generation.	1763	1,280	930	Died 16 days.	General tuberculosis.
,,	0·01 mg.	,,	1764	1,480	1,040	Died 31 days.	General tuberculosis.
Subcutaneous	50·0 mg.	,,	1762	1,160	850	Died 32 days.	General tuberculosis.
,,	10·0 mg.	,,	1765	1,150	870	Died 44 days.	General tuberculosis.

CULTURE FROM THE PRESCAPULAR GLAND OF CALF 608. (*See* Chart, page 52.)
INOCULATED AUGUST 4, 1908. VIRULENCE FOR CALF NOT TESTED.

Intravenous	0·1 mg.	14 days old, 3rd generation.	1877	2,000	1,250	Died 21 days.	General tuberculosis.
,,	0·01 mg.	,,	1878	1,850	1,870	Killed 118 days.	Chronic tuberculosis of lungs and kidneys, not severe. Testes almost caseous throughout.
Subcutaneous	10·0 mg.	,,	1875	2,820	2,950	Killed 118 days.	Chronic tuberculosis, not severe.
,,	10·0 mg.	,,	1876	1,700	1,640	Killed 118 days.	Chronic general tuberculosis, not severe.

CULTURE FROM THE BRONCHIAL GLAND OF MONKEY 186. (*See* Chart, page 51.)
INOCULATED MAY 19, 1908.

Intravenous	1·0 mg.	20 days old, 4th generation.	1771	1,390	870	Died 27 days.	General tuberculosis.
,,	0·1 mg.	,,	1773	1,370	770	Died 78 days.	Chronic general tuberculosis, moderately severe.
,,	0·01 mg.	,,	1774	1,370	900	Died 131 days.	Chronic general tuberculosis. Numerous joints affected and pus in pelvis of kidney.
Subcutaneous	50·0 mg.	,,	1772	1,220	800	Died 152 days.	Local tuberculosis. Slight tuberculosis of lungs, bronchial glands and kidneys. (? cause of death.)
,,	1·0 mg.	,,	1770	1,150	2,300	Killed 153 days.	Local tuberculosis; slight tuberculosis of lungs and kidneys.

GUINEA-PIGS INOCULATED WITH CULTURES OF VIRUS E. II. AFTER PASSAGE.

(*a*) Intraperitoneal.

Source of Culture.	Age and Generation of Subculture Inoculated.	Dose.	No. of Guinea-pig.	Weight in grms.		Duration of Life.	Result.
				Initial.	Final.		
Precap. gland of Calf 404	5th generation, 21 days old.	0·1 mg.	2579	540	290	Died 41 days.	General tuberculosis, quite atypical; caseation was absent in the spleen and liver, and very slight in the glands.
Lung of Calf 504	4th generation, 19 days old.	0·1 mg.	2584	900	550	Died 18 days.	Acute tuberculosis.
Lung of Calf 506	4th generation, 21 days old.	0·1 mg.	2577	620	420	Died 14 days.	Acute tuberculosis.

(*b*) Subcutaneous.

Precap. gland of Calf 404	5th generation, 21 days old.	0·1 mg.	2580	430	370	Died 114 days.	Chronic general tuberculosis.
Lung of Calf 504	4th generation, 19 days old.	0·1 mg.	2583	670	350	Died 55 days.	General tuberculosis with only a moderate amount of caseation in the organs and glands.
Lung of Calf 506	4th generation, 21 days old.	0·1 mg.	2578	860	530	Died 53 days.	General tuberculosis.

RABBITS INOCULATED WITH CULTURES OF VIRUS E. IV. AFTER PASSAGE.

CULTURE FROM THE PRESCAPULAR GLAND OF CALF 408. (*See* Chart, page 123.)

INOCULATED JULY 3, 1907. VIRULENCE FOR CALF NOT INCREASED.

Method of Inoculation.	Dose.	Age and Generation of Subculture Inoculated.	Number of Rabbit.	Weight in Grammes.		Duration of Life.	Results.
				Initial.	Final.		
Intravenous	1·0 mg.	21 days old, 8th generation.	1381	1,900	970	Died 79 days.	General tuberculosis.
„	0·1 mg.	„	1380	1,600	810	Died 75 days.	General tuberculosis.
Subcutaneous	10·0 mg.	„	1383	2,000	1,420	Died 297 days.	Severe chronic general tuberculosis.
„	1·0 mg.	„	1382	1,620	1,950	Died 203 days.	Chronic general tuberculosis, severe in the lungs.

CULTURE FROM THE PRESCAPULAR GLAND OF CALF 408. (*See* Chart, page 123.)

INOCULATED JANUARY 30, 1908. VIRULENCE FOR CALF NOT INCREASED.

Intravenous	1·0 mg.	19 days old, 14th generation.	1620	3,290	1,870	Died 20 days.	General tuberculosis.
„	0·1 mg.	„	1619	2,300	1,120	Died 126 days.	General tuberculosis.
„	0·01 mg.	„	1618	3,250	1,840	Died 95 days.	General tuberculosis.
Subcutaneous	1·0 mg.	„	1621	2,100	1,850	Killed 217 days.	Slight chronic tuberculosis of lungs, testes and kidneys (pus in pelvis of left kidney).

CULTURE FROM THE PRESCAPULAR GLAND OF CALF 408. (*See* Chart, page 123.)

INOCULATED JULY 23, 1908. VIRULENCE FOR CALF NOT INCREASED.

Intravenous	1·0 mg.	23 days old, 11th generation.	1845	2,190	1,750	Died 17 days.	General tuberculosis.
„	1·0 mg.	„	1846	2,250	1,670	Died 47 days	General tuberculosis.

CULTURE FROM THE SPLEEN OF CALF 582. (*See* Chart, page 123.)

INOCULATED MAY 25, 1908. VIRULENCE FOR CALF NOT INCREASED.

Intravenous	0·1 mg.	9 days old, 3rd generation.	1778	2,700	1,390	Died 29 days.	General tuberculosis.
„	0·01 mg.	„	1776	2,800	1,250	Died 107 days.	Chronic tuberculosis of spleen, kidneys, and lungs, not severe.
Subcutaneous	10·0 mg.	„	1775	2,440	2,660	Killed 164 days.	Local tuberculosis and tuberculosis of lungs and kidneys.
„	10·0 mg.	„	1777	2,020	1,070	Died 72 days.	General tuberculosis.

CULTURE FROM THE SUPRARENAL BODY OF CALF 584. (*See* Chart, page 123.)

INOCULATED MAY 29, 1908. VIRULENCE FOR CALF NOT INCREASED.

Intravenous	0·1 mg.	4 days old, 3rd generation.	1780	1,300	880	Died 21 days.	General tuberculosis.
„	0·01 mg.	„	1782	1,090	700	Died 37 days.	General tuberculosis.
Subcutaneous	50·0 mg.	„	1781	1,070	1,090	Died 157 days.	Slight general tuberculosis; caseous nodules around one ankle joint.
„	10·0 mg.	„	1779	950	2,550	Killed 161 days.	Local tuberculosis and tuberculosis of lungs and kidneys, slight and retrogressive.

CULTURE FROM LUNG OF CALF 498. (*See* Chart, page 125.)

INOCULATED JULY 10, 1907. VIRULENCE FOR CALF NOT INCREASED.

Method of Inoculation.	Dose.	Age and Generation of Subculture Inoculated.	Number of Rabbit.	Weight in Grammes.		Duration of Life.	Result.
				Initial.	Final.		
Intravenous	1·0 mg.	21 days old, 4th generation.	1389	2,200	1,400	Died 30 days.	General tuberculosis.
,,	0·1 mg.	,,	1388	2,360	1,870	Died 62 days.	General tuberculosis, moderately severe but not sufficient to cause death.
Subcutaneous	8·0 mg.	,,	1391	1,830	1,080	Died 106 days.	Local tuberculosis and slight tuberculosis of lungs and kidneys. Cause of death not obvious.
,,	1·0 mg.	,,	1390	2,200	2,000	Died 324 days.	Severe general tuberculosis.

CULTURE FROM THE BRONCHIAL GLAND OF CALF 498. (*See* Chart, page 125.)

INOCULATED FEBRUARY 5, 1908. VIRULENCE FOR CALF NOT INCREASED.

Intravenous	1·0 mg.	21 days old, 4th generation.	1629	2,090	1,450	Died 26 days.	General tuberculosis.
,,	0·1 mg.	,,	1628	1,840	1,290	Died 28 days.	General tuberculosis.
,,	0·01 mg.	,,	1627	1,750	1,150	Died 81 days.	General tuberculosis.
,,	0·01 mg.	,,	1632	2,000	1,280	Died 31 days.	General tuberculosis.
Subcutaneous	10·0 mg.	,,	1630	1,470	1,170	Died 197 days.	Slight general tuberculosis.
,,	10·0 mg.	,,	1631	1,380	820	Died 182 days.	Local tuberculosis and slight tuberculosis of lungs, kidneys, and ventral mediastinal glands.

CULTURE FROM THE MEDIASTINAL GLAND OF CALF 586. (*See* Chart, page 125.)

INOCULATED MAY 19, 1908. VIRULENCE FOR CALF NOT INCREASED.

Intravenous	1·0 mg.	10 days old, 4th generation.	1766	1,500	1,020	Died 25 days.	General tuberculosis.
,,	0·1 mg.	,,	1769	1,660	880	Died 41 days.	General tuberculosis.
Subcutaneous	50·0 mg.	,,	1767	1,150	700	Died 86 days.	General tuberculosis.
,,	10·0 mg.	,,	1768	880	770	Died 114 days.	Local tuberculosis, and slight tuberculosis of lungs and kidneys. ? cause of death.

CULTURE FROM THE PRESCAPULAR GLAND OF CALF 588. (*See* Chart, page 125.)

INOCULATED MAY 29, 1908. VIRULENCE FOR CALF NOT INCREASED.

Intravenous	0·1 mg.	8 days old, 3rd generation.	1789	1,240	810	Died 24 days.	General tuberculosis.
,,	0·01 mg.	,,	1790	1,130	650	Died 87 days.	General tuberculosis.
Subcutaneous	50·0 mg.	,,	1787	840	760	Died 61 days.	Septic local lesion (cause of death). Slight tuberculosis of lungs, bronchial glands, and kidneys.
,,	10·0 mg.	,,	1788	790	1,100	Died 158 days.	Cystic local lesion. A few gritty tubercles in the lungs and a caseous nodule in a kidney.

CULTURE FROM THE LUNG OF CALF 502. (*See* Chart, page 126.)

INOCULATED JULY 18, 1907. VIRULENCE FOR CALF HIGH.

Intravenous	1·0 mg.	20 days old, 4th generation.	1421	1,720	1,150	Died 16 days.	General tuberculosis.
,,	0·1 mg.	,,	1420	1,150	850	Died 24 days.	General tuberculosis.
Subcutaneous	10·0 mg.	,,	1419	1,900	1,460	Died 48 days.	General tuberculosis.
,,	1·0 mg.	,,	1418	2,040	1,290	Died 78 days.	General tuberculosis.

CULTURE FROM THE LUNG OF CALF 502. (*See* Chart, page 126.)

Inoculated May 7, 1908. Virulence for calf high.

Method of Inoculation.	Dose.	Age and Generation of Subculture Inoculated.	Number of Rabbit.	Weight in Grammes.		Duration of Life.	Result.
				Initial.	Final.		
Subcutaneous	50·0 mg.	19 days old, 4th generation.	1761	3,170	2,320	Died 49 days.	General tuberculosis.
„	10·0 mg.	„	1760	3,090	1,450	Died 91 days.	General tuberculosis.

CULTURE FROM THE LUNG OF CALF 502. (*See* Chart, page 126.)

Inoculated July 23, 1908. Virulence for calf high.

Intravenous	1·0 mg.	23 days old, 5th generation.	1841	1,920	1,300	Died 14 days.	General tuberculosis.
„	1·0 mg.	„	1842	1,940	1,500	Died 15 days.	General tuberculosis.

CULTURE FROM THE SUPRARENAL BODY OF CALF 502. (*See* Chart, page 126.)

Inoculated January 30, 1908. Virulence for calf increased.

Intravenous	1·0 mg.	21 days old, 3rd generation.	1624	1,950	1,310	Died 23 days.	General tuberculosis.
„	0·1 mg.	„	1623	1,930	1,100	Killed (dying) 28 days.	General tuberculosis.
„	0·01 mg.	„	1622	2,060	1,050	Died 32 days.	General tuberculosis.
Subcutaneous	10·0 mg.	„	1626	2,300	1,040	Died 163 days.	Slight general tuberculosis. Two joints filled with caseo-pus.
„	1·0 mg.	„	1625	2,080	1,750	Killed 217 days.	Local tuberculosis and slight tuberculosis of lungs and kidneys.

CULTURE FROM THE SUPRARENAL BODY OF CALF 502. (*See* Chart, page 126.)

Inoculated April 7, 1908. Virulence for calf increased.

Subcutaneous	50·0 mg.	22 days old, 5th generation.	1720	1,400	950	Killed 188 days	Local tuberculosis and slight tuberculosis of lungs and kidneys.
„	10·0 mg.	„	1719	1,280	1,450	Killed 188 days.	Chronic general tuberculosis severe in the lungs.

CULTURE FROM THE MEDIASTINAL GLAND OF CALF 602. (*See* Chart, page 126.)

Inoculated August 5, 1908. Virulence for calf high.

Intravenous	0·1 mg.	9 days old, 3rd generation.	1880	970	800	Died 17 days.	General tuberculosis.
„	0·01 mg.	„	1879	1,250	950	Died 30 days.	General tuberculosis.
Subcutaneous	10·0 mg.	„	1881	1,070	720	Died 36 days.	General tuberculosis.
„	10·0 mg.	„	1882	1,240	950	Died 33 days.	General tuberculosis.

CULTURE FROM THE SPLEEN OF BABOON 72. (*See* Chart, page 75.)

Inoculated September 13, 1907.

Intravenous	1·0 mg.	21 days old, 4th generation.	1462	2,670	1,680	Died 35 days.	General tuberculosis.
„	0·1 mg.	„	1464	2,040	1,220	Died 33 days.	General tuberculosis.
Subcutaneous	10·0 mg.	„	1465	1,870	1,220	Died 103 days.	General tuberculosis.
„	1·0 mg.	„	1463	1,540	1,210	Died 143 days.	Chronic general tuberculosis; both knee-joints filled with muco-pus.

CULTURE FROM THE COLIC GLAND OF BABOON 72 THROUGH GUINEA-PIG 2420. (*See* Chart, page 75.)

INOCULATED MARCH 25, 1908.

Method of Inoculation.	Dose.	Age and Generation of Sub-culture Inoculated.	Number of Rabbit.	Weight in Grammes.		Duration of Life.	Result.
				Initial.	Final.		
Intravenous	1·0 mg.	21 days old, 4th generation.	1708	2,550	1,870	Died 13 days.	General tuberculosis.
,,	0·1 mg.	..	1707	2,160	1,700	Died 19 days.	General tuberculosis.
Subcutaneous	10·0 mg.	..	1709	2,210	1,420	Died 59 days.	General tuberculosis.
..	10·0 mg.	,,	1710	1,350	950	Died 61 days.	General tuberculosis.

CULTURE FROM THE MESENTERIC GLAND OF BABOON 74. (*See* Chart, page 75.)

INOCULATED APRIL 28, 1908. VIRULENCE FOR CALF NOT INCREASED.

Intravenous	1·0 mg.	20 days old, 5th generation.	1751	1,330	870	Died 25 days.	General tuberculosis.
,,	0·1 mg.	..	1753	1,570	800	Died 71 days.	General tuberculosis.
,,	0·01 mg.	..	1755	1,370	800	Died 104 days.	General tuberculosis moderately severe.
Subcutaneous	50·0 mg.	..	1750	1,300	2,000	Killed 174 days.	Local tuberculosis and slight tuberculosis of lungs, kidneys, each wrist joint, and visceral pleura.
,,	10·0 mg.	..	1754	1,300	1,270	Died 42 days.	Early general tuberculosis. Death premature.
..	10·0 mg.	..	1752	1,310	1,200	Died 171 days.	Local tuberculosis and slight tuberculosis of lungs, kidneys, left testis, and wrist joints, (?) cause of death.

CULTURE FROM THE PRESCAPULAR GLAND OF CALF 616. (*See* Chart, page 76.)

INOCULATED JULY 25, 1908. VIRULENCE FOR CALF NOT TESTED.

Intravenous	1·0 mg.	21 days old. 3rd generation.	1854	1,400	1,000	Died 26 days.	General tuberculosis.
,,	0·1 mg.	,,	1853	1,500	1,300	Died 41 days.	General tuberculosis.
Subcutaneous	50·0 mg.	,,	1855	1,440	2,620	Killed 131 days.	Local tuberculosis and one or two tubercles in the lung and each kidney.
..	50·0 mg.	,,	1856	1,520	1,700	Killed 131 days.	Chronic general tuberculosis of lungs, kidneys, and bronchial glands, not severe.

CULTURE FROM THE PRESCAPULAR GLAND OF CALF 620. (*See* Chart, page 76.)

INOCULATED JULY 25, 1908. VIRULENCE FOR CALF NOT TESTED.

Intravenous	1·0 mg.	24 days old, 3rd generation.	1858	1,500	800	Died 26 days.	General tuberculosis.
,,	0·1 mg.	,,	1857	1,700	1,450	Died 37 days.	General tuberculosis.
Subcutaneous	50·0 mg.	,,	1860	1,340	1,620	Killed 131 days.	Chronic tuberculosis or lungs, kidneys, and bronchial glands, not severe. Severe tuberculosis of both wrist and ankle joints and several small joints of the feet.
,,	1·0 mg.	..	1859	1,270	2,320	Killed 131 days.	Local tuberculosis and slight tuberculosis of lungs and tibia.

GUINEA-PIGS INOCULATED WITH CULTURES OF VIRUS E. IV. AFTER PASSAGE,

(*a*) Intraperitoneal.

Source of Culture.	Dose.	Age and Generation of Subculture.	Number of Guinea-pig.	Weight in grms.		Duration of Life.	Result.
				Initial.	Final.		
Lung of Calf 498	0·1 mg.	4th generation, 21 days old.	2562	330	210	Died 21 days.	Acute general tuberculosis.
Lung of Calf 502	0·1 mg.	4th generation, 20 days old.	2582	550	310	Died 18 days.	Acute general tuberculosis.
Spleen of Baboon 72	0·1 mg.	4th generation, 21 days old.	2618	320	180	Died 35 days.	General tuberculosis. Disease less acute than that produced by the bovine bacillus, less caseation and absence of adhesions of the omentum.

(*b*) Subcutaneous.

Source of Culture.	Dose.	Age and Generation of Subculture.	Number of Guinea-pig.	Initial.	Final.	Duration of Life.	Result.
Lung of Calf 498	0·1 mg.	4th generation, 21 days old.	2563	300	250	Died 125 days.	Chronic tuberculosis with slight affection of distal lymphatic glands.
Lung of Calf 502	0·1 mg.	4th generation, 20 days old.	2581	570	370	Died 42 days.	General tuberculosis, differing very slightly from the usual bovine type.
Spleen of Baboon 72	0·1 mg.	4th generation, 21 days old.	2617	370	470	Died 108 days.	Chronic general tuberculosis.

VIRUS E. II.
CALF PASSAGE EXPERIMENTS.
PASSAGE *a*.

CULTURE.

Derived from the original material through a guinea-pig; total duration of artificial cultivation, 130 days. The 7th generation, 21 days old, was used for inoculation on April 30, 1906.

CALF 404.

Subcutaneous.
Dose: 10·0 mg.
Killed: July 28, 1906. 89 days.

P.M.—Small fibrous-walled cyst containing caseo-pus at seat of inoculation; a caseous patch and numerous soft yellow gritty tubercles in left prescapular gland; small scattered yellowish foci in a thoracic and one renal gland; one small fibrous nodule with yellow centre in liver (no T.B. seen).

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
838	Intrav.	1·0 mg.	D. 24 days	Early G. T.
839	Intrav.	0·1 mg.	D. 22 ,,	Early G. T.
842	Subcut.	1·0 mg.	K. 111 ,,	Local T. and five tubercles in the lung.
843	Subcut.	0·1 mg.	K. 112 ,,	Local T. and one nodule in the lung.

CULTURE.

Derived from the prescapular gland.

The 10th generation, 21 days old, was inoculated on February 12, 1908. Total duration of artificial cultivation, 564 days.

The 5th generation, 21 days old, was inoculated on July 17, 1907; total duration of artificial cultivation, 354 days.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1415	Intrav.	1·0 mg.	D. 24 days	Acute G. T.
1414	Intrav.	0·1 mg.	D. 23 ,,	Acute G. T.
1417	Subcut.	10·0 mg.	D. 155 ,,	Slight chronic G. T.
1416	Subcut.	1·0 mg.	D. 128 ,,	Chronic G. T.

RHESUS MONKEY 212.

Fed for five days with 10·0 mg. per day, of culture derived from Calf 404, on April 8–12, 1908.

Died: June 29, 1908. (82 days after first feed.)

P.M.—About half the mesenteric glands were a little enlarged and showed soft caseous nodules and small patches; in the mesentery near the affected glands there were a few caseous streaks and tubercles. In the lungs there were three minute tubercles. There was no tuberculosis elsewhere. Death was caused by non-tuberculous ulceration of large intestine.

CALF 590.

Subcutaneous.
Dose: 50·0 mg.
Died: February 19, 1908. 7 days.

P.M.—Death was due to chronic diarrhœa and purulent broncho-pneumonia.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1635	Intrav.	1·0 mg.	D. 20 days	Acute G. T.
1634	Intrav.	0·1 mg.	D. 106 ,,	T. of lungs, kidneys, and testes.
1633	Intrav.	0·01 mg.	D. 181 ,,	Chronic G. T.
1636	Subcut.	10·0 mg.	K. 204 ,,	Local lesion and slight T. of lungs.
1637	Subcut.	10·0 mg.	K. 204 ,,	Local T. and very slight T. of lungs and kidneys.

CALF 598.

Subcutaneous.
Dose: 50·0 mg
Killed · May 13, 1908. 91 days.

P.M.—There was a cyst with muco-purulent caseous contents at the seat of inoculation. The left prescapular gland contained a small caseo-calcareous and partly softened patch. One cervical gland was caseo-calcareous. There were two or three opaque foci in the liver and one iliac gland.

CULTURE.

Derived from the spleen. The 3rd generation, 21 days old, was inoculated on April 29, 1908; the total duration of artificial cultivation was 70 days.

CALF 618.

Subcutaneous.
Dose: 50·0 mg.
Killed: July 22, 1908. 84 days.

P.M.—There was a cyst at the seat of inoculation containing soft caseo-necrotic substance, and the left prescapular gland contained two cystic nodules, the largest 1 cm. in diameter. There was no tuberculosis elsewhere.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1756	Intrav.	0·1 mg.	D. 32 days	Acute G. T.
1757	Intrav.	0·01 mg.	D. 119 ,,	Chronic G. T. Severe in lungs.
1758	Subcut.	50·0 mg.	D. 112 ,,	Slight chronic G. T.
1759	Subcut.	10·0 mg.	D. 145 ,,	Slight chronic G. T.

CULTURE.

Derived from the prescapular gland. The 2nd generation, 6 days old, was inoculated on August 6, 1908 The total duration of artificial cultivation was 15 days.

RABBITS.

Number	Method	Dose.	Duration of Life.	Result.
1894	Intrav.	1·0 mg.	D. 17 days	Acute G. T.
1893	Intrav.	0·1 mg.	D. 35 ,,	G. T.
1895	Subcut.	10·0 mg.	D. 92 ,,	G. T.
1896	Subcut.	10·0 mg.	D. 64 ,,	Progressive and fairly severe T. Death apparently premature.

CULTURE.

Derived from the prescapular gland. The 3rd generation, 2 days old, was inoculated on May 29, 1908; the total duration of artificial cultivation was 16 days.

CALF 640.

Subcutaneous.
Dose: 50·0 mg.
Killed: September 1, 1908. 95 days.

P.M.—The tumour at the seat of inoculation was a cyst filled with caseo-pus. The left prescapular gland was caseous and softened; several other glands on this side showed varying degrees of caseation. There were seven caseating tubercles and a caseous nodule in the lungs, and two dozen caseous nodules in the spleen. The thoracic glands were beset with caseous nodules; similar nodules were seen in five mesenteric, two lumbar, and one pharyngeal glands: the coeliac and portal glands contained caseous gritty tubercles.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1783	Intrav.	0·1 mg.	D. 27 days	Acute G. T.
1784	Intrav.	0·01 mg.	D. 73 ,,	Chronic G. T.
1785	Subcut.	10·0 mg.	K. 161 ,,	Slight T
1786	Subcut.	10·0 mg.	D. 21 ,,	Death premature, cause not obvious.

VIRUS E. II.—*continued*

CALF PASSAGE EXPERIMENTS—*continued*

PASSAGE β.

CULTURE.

Derived from the original material through a guinea-pig; total duration of artificial cultivation, 130 days. The 7th generation, 21 days old, was used for inoculation on April 30, 1906.

CALF 406.

Subcutaneous.
Dose : 10·0 mg.
Killed : July 30, 1906.
91 days.

P.M.—There was a small fibro-caseous local tumour; the left prescapular gland was extensively caseated. In the lungs there were seven nodules up to a hempseed in size with yellow centres and grey margins, and a few small grey tubercles. The terminal mesenteric, ileo-colic, and several colic glands contained fairly numerous yellow gritty tubercles; one bronchial and one pharyngeal gland contained one in each.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
838	Intrav.	1·0 mg.	D. 24 days	Early G. T.
839	Intrav.	0·1 mg.	D. 22 ,,	Early G. T.
842	Subcut.	1·0 mg.	K. 111 ,,	Local T. and five tubercles in the lung.
843	Subcut.	0·1 mg.	K. 112 ,,	Local T. and one nodule in the lung.

CULTURE.

Derived from the prescapular gland. The 10th generation, 17 days old, was inoculated on February 18, 1908; the total duration of artificial cultivation was 568 days.

CALF 596.

Subcutaneous.
Dose : 50·0 mg.
Killed : May 18, 1908.
90 days.

P.M.—There was a small fibrous-walled cyst at the seat of inoculation; the adjacent prescapular gland was large and caseous. The lungs contained a moderate number of caseating nodules up to 1 cm. in diameter; there were four in the liver, one in the spleen, and several in the small intestine. There were a few fibro-caseous nodules on the pleura. The suprarenals contained caseating tubercles. The thoracic glands were enlarged and caseating, the portal glands contained small caseous patches.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1663	Intrav.	1·0 mg.	D. 27 days	Acute tuberculous lesions, not developed. Less affected than 1662.
1662	Intrav.	0·1 mg.	D. 27 ,,	Acute G. T.
1661	Intrav.	0·01 mg.	D. 33 ,,	Acute G. T.
1664	Subcut.	10·0 mg.	D. 115 ,,	Chronic G. T.
1665	Subcut.	10·0 mg.	K. 188 ,,	Local T. and slight T. of lungs and mammary gland.

CULTURE.

Derived from the lung. The 3rd generation, 4 days old, was inoculated on June 10, 1908, the total duration of artificial cultivation was 23 days.

CALF 638.

Subcutaneous.
Dose : 50·0 mg.
Killed when ill : July 20, 1908.
40 days.
P.M.—General tuberculosis.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1796	Intrav.	0·1 mg.	D. 19 days	Acute G. T.
1795	Intrav.	0·01 mg.	D. 30 ,,	Acute G. T.
1798	Subcut.	50·0 mg.	D. 107 ,,	G. T.
1797	Subcut.	10·0 mg	D. 94 ,,	G. T.

CALF 600.

Subcutaneous.
Dose : 50·0 mg.
Killed : July 3, 1908.
136 days.

P.M.—There was a tense cyst filled with muco-pus at the seat of inoculation; the left prescapular gland contained a pea-sized caseous nodule; one cervical gland was a cyst filled with muco-pus. There were sparsely scattered foci on the surface of the liver, and one lumbar gland contained caseous foci. No tuberculosis elsewhere.

CULTURE.

Derived from the prescapular gland. The 3rd generation, 14 days old, was inoculated on August 4, 1908; the total duration of artificial cultivation was 32 days.

CALF 648.

Subcutaneous.
Dose : 50·0 mg.
Killed : October 26, 1908.
83 days.

P.M.—There was a fibro-caseous local tumour, and the left prescapular gland contained two caseo-necrotic masses. One cervical gland was caseous, another contained two patches beset with caseous foci. A number of the Malpighian bodies of the spleen showed minute central opacities (smear, no T.B.), and there were a few grey foci in the liver (smear, no T.B.).

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1873	Intrav.	0·1 mg.	D. 34 days	G. T.
1874	Intrav.	0·01 mg.	K. 119 ,,	Chronic G. T
1871	Subcut.	10·0 mg.	K. 119 ,,	Chronic G. T., moderately severe in lungs.
1872	Subcut.	1·0 mg.	K. 119 ,,	Slight T.

VIRUS E. II.—*continued.*

Calf Passage Experiments—*continued*

PASSAGE γ.

CULTURE.

Derived from the original material through a guinea-pig. Total duration of artificial cultivation, 405 days. The 19th generation, 21 days old, was used for inoculation on January 30, 1907.

CALF 504.

Subcutaneous.
Dose : 50·0 mg.
Killed : May 10, 1907.
100 days.

P.M.—Fibrous - walled cyst at seat of inoculation. Left prescapular gland extensively caseo-necrotic. There were four or five tubercles in the lungs, one in a kidney, and a number of soft yellow nodules in the small intestine (T.B. seen). The thoracic and portal glands showed an occasional minute focus, the renal, mesenteric and ileo-colic glands scattered gritty tubercles.

RABBITS.

Number	Method.	Dose.	Duration of Life.	Result.
1221	Intrav.	1·0 mg.	D. 34 days	G. T.
1222	Intrap.	1·0 mg.	D. 88 „	Slight G. T. and severe pseudo-T. of spleen.
1223	Subcut.	10·0 mg.	D. 37 „	Local lesion only Death from pleurisy.

CULTURE.

Derived from the prescapular gland. The 4th generation, 21 days old, was inoculated on April 3, 1908. The total duration of artificial cultivation was 329 days.

CALF 626.

Subcutaneous.
Dose : 50·0 mg.
Died : May 27, 1908.
54 days.

P.M.—General tuberculosis.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1713	Intrav.	0·1 mg.	D. 13 days	Early G. T. Death from diarrhoea.
1715	Intrav.	0·01 mg.	D. 101 „	Chronic retrogressive T. Death from purulent pleurisy.
1714	Subcut.	10·0 mg.	D. 80 „	G. T.
1716	Subcut.	1·0 mg.	D. 79 „	G. T.

CULTURE.

Derived from the lung. The 4th generation, 19 days old, was inoculated on June 23, 1907. The total duration of artificial cultivation was 74 days.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1422	Intrav.	1·0 mg.	D. 15 days	Acute G. T.
1423	Intrav.	0·1 mg.	D. 21 „	Acute G. T.
1424	Subcut.	10·0 mg.	D. 50 „	Early G. T. Death premature from abscess in the back.
1425	Subcut.	1·0 mg.	D. 23 „	Early T. Death from psorospermosis.

CULTURE.

Derived from the lung. The 10th generation, 21 days old, was inoculated on January 29, 1908. The total duration of artificial cultivation was 264 days.

CALF 578.

Subcutaneous.
Dose : 50·0 mg.
Killed : April 28, 1908.
90 days.

P.M.—Slight retrogressive general tuberculosis.

CALF 580.

Subcutaneous.
Dose : 50·0 mg.
Died : February 27, 1908.
29 days.

P.M.—General tuberculosis.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1614	Intrav.	1·0 mg.	D. 11 days	Early G. T.
1613	Intrav.	0·1 mg	D. 27 „	Acute G. T.
1612	Intrav.	0·01 mg.	D. 26 „	Acute G. T.
1615	Subcut.	1·0 mg.	D. 58 „	G. T.

VIRUS E. II.—*continued.*

CALF PASSAGE EXPERIMENTS—*continued.*

PASSAGE 5.

CULTURE.

Derived from the original material through a guinea-pig. Total duration of artificial cultivation, 405 days. The 19th generation, 21 days old, was used for inoculation on January 30, 1907.

CALF 506.

Subcutaneous.

Dose : 50·0 mg.

Killed : May 9, 1907. 99 days.

P.M.—Fibrous-walled cyst at seat of inoculation. Two caseo-calcareous nodules and scattered tubercles in left prescapular gland ; one cervical gland caseo-calcareous. The lungs contained two hard grey nodules and a collection of minute grey tubercles and an occasional translucent focus. One bronchial and one portal gland contained one or more small foci.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1221	Intrav.	1·0 mg.	D. 34 days	G. T.
1222	Intrap.	1·0 mg.	D. 88 „	Slight G. T., and severe pseudo-T. of spleen.
1223	Subcut.	10·0 mg.	D. 37 „	Local lesion only. Death from pleurisy.

CULTURE.

Derived from the lung. The 4th generation, 21 days old, was inoculated on July 17, 1907 ; the total duration of cultivation was 69 days.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1411	Intrav.	1·0 mg.	D. 16 days	Acute G. T.
1410	Intrav.	0·1 mg.	D. 23 „	Acute G. T.
1413	Subcut.	10·0 mg.	D. 74 „	Severe caseating pneumonia of lungs ; a few scattered lesions elsewhere in the body.
1412	Subcut.	1·0 mg.	D. 80 „	G. T.

CULTURE.

Derived from the lung. The 11th generation, 17 days old, was inoculated on February 18, 1908 ; the total duration of artificial cultivation was 285 days.

CALF 594.

Subcutaneous.

Dose : 50·0 mg.

Died : March 5, 1908.

16 days.

P.M. — Early tuberculosis. Death from broncho-pneumonia.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1668	Intrav.	1·0 mg.	D. 17 days	Acute G. T.
1667	Intrav.	0·1 mg.	D. 26 „	Acute G. T.
1666	Intrav.	0·01 mg.	D. 30 „	G. T.
1669	Subcut.	10·0 mg.	D. 39 „	Acute G. T.
1670	Subcut.	10·0 mg.	D. 46 „	G. T.

CULTURE.

Derived from the lung. The 16th generation, 23 days old, was inoculated on April 3, 1908 ; the total duration of artificial cultivation was 330 days.

CALF 628.

Subcutaneous.

Dose : 50·0 mg.

Killed : July 2, 1908.

90 days.

P.M.—Slight general tuberculosis.

CULTURE.

Derived from the lung. The 3rd generation, 14 days old, was inoculated on August 4, 1908 ; the total duration of artificial cultivation was 33 days.

CALF 646.

Subcutaneous.

Dose : 50·0 mg.

Died : September 6, 1908.

33 days.

P.M.—General tuberculosis.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1869	Intrav.	0·1 mg.	D. 28 days	G. T. acute.
1870	Intrav.	0·01 mg.	D. 21 „	G. T. acute
1867	Subcut.	10·0 mg.	D. 83 „	G. T.
1868	Subcut.	10·0 mg.	D. 49 „	G. T.

RABBITS 1843 and 1844.

Intravenous.

Dose : 1·0 mg.

Died : 15 and 20 days respectively of acute G. T.

RHESUS MONKEY 206.

Fed for 5 days.

Dose : 10·0 mg. per day.

Killed when dying : May 11, 1908.

38 days.

P.M.—General tuberculosis

VIRUS E. II.—*continued.*

RABBIT PASSAGE EXPERIMENT.

CULTURE.

Derived from the original material through a guinea-pig. Total duration of artificial cultivation, 510 days. The 25th generation, 21 days old, was used for inoculation on May 15, 1907.

RABBIT 1330.

Subcutaneous (and partly intraperitoneal).

Dose : 1·0 mg.

Died in 265 days.

P.M.—Local tuberculosis, tuberculosis of peritoneum, of pleura, diaphragm and lungs (severe), and of the kidneys.

CULTURE.

Derived from the diaphragm. The 4th generation, 21 days old, was inoculated on May 11, 1908 ; the total duration of artificial cultivation was 97 days.

CALF 632.

Subcutaneous.

Dose : 50·0 mg.

Died : June 18, 1908.

38 days.

P.M.—General tuberculosis

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1763	Intrav.	0·1 mg.	D. 16 days	Acute G. T.
1764	Intrav.	0·01 mg.	D. 31 ,,	Acute G. T.
1762	Subcut.	50·0 mg.	D. 32 ,,	Acute G. T.
1765	Subcut.	10·0 mg.	D. 44 ,,	G. T.

CALF 590. Virus E. II.

Subcutaneous inoculation of culture derived from the prescapular gland of Calf 404.

Dose—50·0 milligrammes.

Date of Inoculation—February 12, 1908. [Age 10 weeks.]

Died—February 19, 1908. [7 days after inoculation.]

Clinical Notes.

The animal was weakly and was suffering from diarrhœa when inoculated.

Weights.	kilos.
February 12, 1908	41·26
February 19, 1908	39·45

Loss of weight.—1·81 kilos.

POST-MORTEM EXAMINATION.

The animal died from chronic diarrhœa and purulent broncho-pneumonia.

A number of discrete colonies of tubercle bacilli appeared on a culture tube sown from the spleen.

RHESUS MONKEY 212. Virus E. II.

Fed with culture derived from the prescapular gland of Calf 404.

Dose—50 milligrammes. [Administered 10 mg. per day for a period of five days.]

Date of first feed—April 8, 1908.

Died—June 29, 1908. [82 days after feeding.]

Clinical History.

The animal remained well until a fortnight before its death, when its eyelids became oedematous. Its appetite remained good until the last two days. It became seriously ill on the morning of June 29 and died in the afternoon.

POST-MORTEM EXAMINATION.

Body in fair condition.

Tongue, Tonsils, Larynx, and Pharynx.—Normal.

Submaxillary and Cervical Glands.—Normal

Abdomen.

Intestines.—The small intestine was normal.

The large intestine showed two areas about 8 or 9 cm. in length in which there were numerous irregular ulcerated patches covered with adherent shreds of necrotic substance and faecal matter. The mucous membrane forming the edges was raised, oedematous and congested. In the rest of the large intestine there were scattered smaller ulcerated patches, some covered with similar shreds of necrotic substances, others containing a centre of soft caseous substance easily picked out; some were flat, others had raised margins.

The colic glands were normal.

Mesenteric Glands.—About half the mesenteric glands were a little enlarged and showed discrete soft caseous nodules and small patches of soft caseous substance beneath the cortices which easily shelled out leaving normal gland tissue; other mesenteric glands were normal.

Mesentery.—In the mesentery, at that part which contained the affected glands, there were a few caseous streaks and lines of caseous tubercles.

Spleen.—Normal.

Liver.—Normal.

Kidneys.—Normal.

Thorax.

Lungs.—In the right lung there was a single minute grey tubercle with a caseous centre. In the left there were two minute completely transparent tubercles.

There was no tuberculosis of any other organ or gland in the body.

Microscopical Examinations.

(Smear preparations.)

Ulcers from Large Intestine—

No. I.—Necrotic covering	No tubercle bacilli.
No. II.—Caseous centre	Numerous blue staining organisms.

Mesenteric Gland.—Numerous tubercle bacilli.

MONKEY 206. Virus E. II.

Fed with culture derived from the lung of Calf 506.

Dose—50 milligrammes. [Administered in milk, 10 mg. each day for five days.]

Date of Feeding—April 3, 1908.

Killed when dying—May 11, 1908. [38 days after the first feeding.]

Clinical Notes.

The monkey was fed naturally with milk containing the culture. It speedily became ill, lost flesh and was killed in a dying condition 38 days after the experiment began.

POST-MORTEM EXAMIMATION.

Tongue, Pharynx, Larynx, and Trachea.—Normal.

Tonsils.—Each was slightly enlarged and prominent and on section was beset with soft yellowish-grey foci.

Submaxillary Glands.—On the right side one gland contained three soft caseous tubercles. A gland on the left side was enlarged and almost replaced by soft yellow caseous substance. The rest were normal.

Retro-pharyngeal Glands.—Each was enlarged and contained caseo-purulent nodules.

Cervical Glands.—A deep superior cervical gland on the right side showed a soft yellow nodule the size of a hemp seed. Other glands were normal.

Small Intestine.—All the Peyer's patches were enlarged, ulcerated and closely beset with soft caseous foci which, when seen from the peritoneal surface, formed complete caseous layers. Beneath the mucous membrane were also numerous opaque foci.

Large Intestine.—Normal.

Mesenteric Glands.—The majority of the mesenteric glands were adherent, forming a mass 4·5 by 2·5 by 1·6 cm. On section the glands were cystic and filled with caseo-purulent substance. In the smaller isolated glands there were soft caseous nodules.

Colic Glands.—The ileo-colic and many of the colic glands contained soft caseous nodules.

Abdomen.

Omentum.—There were two translucent foci on the omentum, one of which was opaque in the centre.

Spleen.—It contained moderately numerous discrete soft yellowish nodules, varying up to 3·5 mm. in diameter.

Liver.—On the surface beneath the capsule there were moderately numerous greyish-white softening tubercles, varying from a grey point up to a millet seed in size. On section they were distributed throughout the substance in rather greater numbers.

Kidneys.—In the cortex of the left there was a single minute grey tubercle. Otherwise the kidneys were normal.

Suprarenal Bodies.—Normal.

Pancreas.—Normal.

Thorax.

Lungs.—The lungs collapsed fairly well but were a little oedematous: they contained a moderate number of discrete grey caseating nodules up to 5 and 6 mm. in diameter: about twenty-four were counted in each lung.

Bronchial Glands.—The bronchial glands were moderately enlarged and the cortices were almost replaced by closely placed soft yellowish caseous nodules.

The coeliac and lumbar glands and a left inguinal gland contained discrete caseo-purulent nodules.

Other lymphatic glands were normal.

Microscopical Examinations.

(Smear preparations.)

Tonsil.—Numerous tubercle bacilli.

Peyer's Patch.—Numerous tubercle bacilli.

CALF 632. Virus E. II.

Subcutaneous inoculation with culture derived from the diaphragm of Rabbit 1330.

Dose—50·0 milligrammes.

Date of Inoculation—May 11, 1908. [Age 12 weeks.]

Died—June 18, 1908. [38 days after inoculation.]

Temperature.

Temperature was practically normal except for a slight rise to 39·7° on the 31st day.

Weights.

	kilos.
May 11, 1908	53·51
June 18, 1908	48·07

Loss in weight.—5·44 kilos.

POST-MORTEM EXAMINATION.

General condition poor.

Local Lesion.—At the seat of inoculation in the subcutaneous tissue on the left side of the neck, there was a tumour measuring 11 by 8 by 5 cm.; the skin over it was dry and dead but not ulcerated. On section it was composed of pinkish caseo-necrotic tissue with a small cavity in the centre.

Prescapular Glands.—The left prescapular gland measured 9 by 5 by 5 cm. On section it was replaced by firm pinkish caseous tissue.

The tissues around the gland were congested and oedematous.

The right prescapular gland contained caseous nodules up to a pea in size.

Prepectoral Glands.—The cortices of the left prepectoral glands were filled with discrete caseous foci and small tubercles.

The right prepectoral glands contained a few caseous tubercles.

Cervical Glands.—The left inferior cervical gland measured 1·6 cm. in diameter and was caseous throughout. The left superior cervical gland showed a few caseous tubercles.

Other cervical glands showed caseous tubercles.

Thorax.

Lungs.—The lungs were voluminous and heavy, the anterior and inferior portions sinking in water. The lung substance was firm and congested and on section was closely filled with irregular caseous tubercles, varying up to about a millet seed and mainly aggregated into small collections.

Mediastinal Glands.—The caudal mediastinal gland measured 15 by 4·7 by 2·5 cm.

On section the cortex was firm, grey and partly replaced by a close network of caseated tissue.

The anterior dorsal mediastinal glands were enlarged congested and almost wholly replaced by caseous tissue.

The bronchial glands were similarly severely affected.

The gland on the left side just within the thorax was enlarged, firm and partly caseous.

Heart.—Normal.

Abdomen.

Diaphragm.—On the peritoneal surface of the diaphragm there were a few loosely attached fibrous nodules.

Omentum.—The omentum contained numerous loosely-attached fibrous nodules aggregated into collections and ranging up to 4 mm. in diameter.

Intestines.—In the mucous membrane and the Peyer's patches of the small intestines, there was a moderate number of yellow caseous tubercles varying up to nearly a millet seed in size.

Colic Glands.—The colic glands showed discrete irregular caseous tubercles.

The gastric glands were similar.

Mesenteric Glands.—These glands showed their cortices closely filled with irregular caseous nodules, sometimes replacing a considerable part of the cortices.

Spleen.—The spleen weighed 453 grammes. On the surfaces there were about ten flattened caseating nodules some loosely attached, the largest 8 mm. in diameter. On section the pulp was closely filled with hemp-seed sized caseous nodules.

Liver.—On the surface of the liver just beneath the capsule there could be seen numerous tubercles varying from a grey point up to a nodule 2 mm. in diameter. A number, the majority on the concave surface, had grown out above the surface; the larger were caseous. On section through the substance the tubercles were more sparsely distributed and much smaller.

Portal Glands.—The portal glands were enlarged and the cortices were replaced by caseating tissue.

Kidneys.—Each kidney contained scattered caseating nodules up to a millet seed in size.

Suprarenal Bodies.—Each suprarenal body contained two or three caseating tubercles.

Tongue.—Normal.

Tonsils.—There were a few caseous foci in the tonsils.

On the posterior aspect of the larynx there was a congested caseous ulcer and two congested flattened tubercles; one similar tubercle in the trachea.

There was a submiliary tubercle in the pharynx.

The coeliac and lumbar glands were enlarged and almost entirely caseous.

The pudic, submaxillary, axillary, and iliac glands contained varying numbers of discrete irregular caseous nodules up to the size of a pea.

The popliteal and gluteal glands contained caseous tubercles up to a hemp seed in size.

The posterior pharyngeal glands contained numerous irregular caseous patches.

CALF 646. Virus E. II.

Subcutaneous inoculation with culture derived from the lung of Calf 628.

Dose—50 milligrammes.

Date of Inoculation—August 4, 1908. [Age about five months.]

Died—September 6, 1908. [33 days after inoculation.]

Clinical History.

The animal became ill after about 14 days and rapidly emaciated.

Weights.

	kilos.
August 4, 1908	79·81
September 6, 1908	65·30

Total loss of weight.—14·51 kilos.

POST-MORTEM EXAMINATION.

Carcass emaciated.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a large dependent tumour, weighing with skin and muscle, 3·71 kilos; the tissues around were oedematous. On section the mass consisted of first skin and a layer of congested caseo-necrotic tissue, and then the underlying adherent muscle, which was infiltrated by congested caseous tissue.

Prescapular Glands.—The left prescapular gland measured 13 by 7 by 5·5 cm. It was adherent to the tumour, and there was oedematous fluid in the periglandular tissues. On section the gland consisted throughout of yellowish caseo-necrotic tissue mottled with congested foci.

The right prescapular gland was dark and congested, and the cortex was firm and beset with caseous foci.

Prepectoral Glands.—The left rounded prepectoral gland the size of a sparrow's egg was firm and caseated.

The left reniform prepectoral gland was enlarged; the cortex was firm and caseating. There were a few minute caseous tubercles in the cortex of one right prepectoral gland.

Cervical Glands.—The left inferior cervical gland, the size of a partridge's egg, was caseous throughout.

A left middle cervical gland was enlarged and more than half caseous.

A right inferior cervical gland was congested and oedematous, and showed minute opaque foci just visible.

All the other cervical glands contained discrete caseous tubercles.

The tissues about the head and the neck were markedly congested and oedematous.

Thorax.

Lungs.—The lungs were heavy and voluminous; the anterior lobes were solid and sank in water. The posterior lobes were oedematous and congested.

On section the lung parenchyma was closely beset with irregular caseous tubercles.

Thoracic Lymphatic Glands.—The caudal mediastinal gland measured 10·5 by 3 by 2·7 cm. It was firm and deeply congested, and on section the margin of the cortex consisted of grey translucent tissue beset with opaque foci.

The other mediastinal and the bronchial glands resembled the caudal gland, except that one large mediastinal and the left bronchial gland showed the cortices more extensively replaced.

Heart.—Normal.

Abdomen.

Omentum.—In the omentum there were scattered congested fibro-caseous nodules up to a hemp seed in size.

Intestines.—The intestines were congested, but showed no tubercles.

Mesenteric Glands.—The mesenteric glands showed sparsely scattered discrete early caseous tubercles.

Spleen.—In the spleen there were numerous irregular discrete caseous tubercles, somewhat difficult to see and not larger than rape seed. Just beneath the capsule there was a fibrous nodule with a soft caseous centre.

Liver.—In the liver throughout the whole substance there were numerous grey tubercles with opaque yellow centres, varying up to about a millet seed in size.

Portal Glands.—The cortices of the portal glands contained moderately numerous caseous foci surrounded by small firm grey areas.

Kidneys.—In the kidneys, in both the superficial and the deep parts of the cortices, there were scattered caseating tubercles up to a millet seed in size.

Suprarenal Bodies.—In the suprarenal bodies there were a few yellowish rape-seed sized tubercles.

The precrural, popliteal, axillary, submaxillary, and retro-pharyngeal glands were beset with irregular discrete caseous tubercles.

The iliac, lumbar, and coeliac glands were normal.

In the larynx there were about two dozen flattened congested caseous tubercles.

The pharynx was deeply congested.

There were caseous foci in the tonsils.

CALF 628. Virus E. II.

Subcutaneous inoculation with culture derived from the lung of Calf 506.

Dose—50·0 milligrammes.

Date of Inoculation—April 3, 1908. [Age 14 weeks.]

Killed when in good general health—July 2, 1908. [90 days after inoculation.]

Temperature.

The temperature rose to 39·8° Centigrade on the 20th day, and remained about 39·4° Centigrade until the animal was killed.

Weights.

	kilos.
April 3, 1908	62·19
July 2, 1908	65·30

Gain in weight—3·18 kilos.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a roughly pear-shaped prominent tumour weighing 396 grammes and measuring 15 by 8 by 5 cm. On section it consisted of firm caseous substance, pinkish in the centre, yellow and gritty around the margins; it was separated from the underlying muscle by a layer of greyish-white fibrous tissue beset with caseous tubercles; there was a little infiltration of the deeper part of the skin. Passing from the tumour were two fibro-caseous cords varying in width up to a centimetre in diameter, one to the prescapular gland, the other to the middle cervical gland.

Prescapular Glands.—The left prescapular gland measured 6 by 3·3 by 3 cm. On section it was replaced, except for a few small translucent patches, by firm pinkish caseo-necrotic tissue, yellow and slightly gritty around the margins. The right prescapular gland measured 4 by 1·6 by 8 cm. On section it contained one grey pea-sized nodule softening and caseous in the centre and a soft miliary nodule.

Prepectoral Glands.—The left reniform prepectoral gland contained one irregular caseous gritty miliary tubercle.

The right prepectoral glands showed soft caseous foci.

Cervical Glands.—The left inferior cervical gland was enlarged and rounded, measuring nearly 2 cm. in diameter. On section except for a central core it was replaced by firm caseo-necrotic tissue.

Two glands in the middle of the neck, about the size of sparrow's eggs, resembled the above. A third was partly caseous.

The left superior cervical gland contained four caseous tubercles up to a millet seed.

The right cervical glands contained an occasional soft caseous or gritty focus.

The submaxillary glands were similar.

Axillary Glands.—The left axillary gland contained one, and the right axillary gland two, minute caseous tubercles.

Thorax.

Pleura.—Normal.

Lungs.—The lungs were crepitant; they showed on the surfaces beneath the pleura sparsely scattered minute transparent tubercles, opaque in the centre; there were also in the posterior halves of the caudal lobes several dark reddish-grey nodules up to 2 cm. square, from which on section a yellowish muco-pus could be expressed.

Mediastinal Glands.—The caudal mediastinal gland measured 7·5 by 3 by 2·2 cm. It was firm and on section a considerable part of the cortex was replaced by a sharply defined margin of yellow firm caseated tissue beset with calcareous granules. At one part, a small cavity containing serum had been formed.

A second mediastinal gland showed the cortex of about half the gland replaced by firm yellow caseous tissue with gritty foci.

A third showed two patches of grey tissue beset with calcareous granules.

Bronchial Glands. — The bronchial glands were enlarged and showed a considerable portion of the cortices replaced by firm caseated tissue beset with calcareous granules.

Heart and Diaphragm.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Intestines.—Beneath the mucous membrane of the small intestine in its whole length there were numerous caseo-purulent nodules, which formed elevations of the mucous membrane up to 6 and 8 mm. in diameter; the majority showed a central pit or a small ulcer; they were most numerous in the Peyer's patches.

There were numerous similar nodules and ulcers in the large intestine.

Mesenteric Glands.—These glands were a little enlarged and firm. All contained moderately numerous nodules some of which were composed of grey tissue with a caseous network, some were soft and caseous and others consisted of a collection of calcareous granules. Several nodules showed congestion around and many easily shelled out from the gland substance.

Spleen.—The spleen weighed 169 grammes. On section it showed in the pulp moderately numerous soft yellow caseous and gritty tubercles, the size of rape seed.

Liver.—Normal.

Gall Bladder.—Normal.

Portal Glands.—The cortices of the portal glands were beset with small collections of caseo-calcareous tubercles.

Kidneys.—Normal.

Suprarenal Bodies.—The right suprarenal body contained eight grey miliary tubercles with caseous slightly gritty centres. The left contained more numerous slightly larger tubercles.

Tongue, Tonsils, Larynx, and Pharynx.—Normal.

Various Lymphatic Glands.

The Iliac, Mammary Lymphatic, Right Popliteal, Ischiatic and Gastric Glands showed a few yellow caseous tubercles easily picked out and less than a rape seed in size.

The Parotid and Left Popliteal Glands contained discrete collections of caseo-purulent substance up to a pea in size.

The Lumbar Glands showed fairly numerous yellow caseous foci and fine caseous gritty streaks aggregated into small collections.

The Retro-pharyngeal Glands showed a few soft caseous or gritty foci.

Microscopical Examinations.

(Smear preparations.)

Emulsion of Lung.—A moderate number of tubercle bacilli.

Lung (pus).—A few tubercle bacilli.

Spleen (tubercle).—A few tubercle bacilli.

Lumbar Gland (focus).—Moderately numerous tubercle bacilli.

Mesenteric Gland.—Moderately numerous tubercle bacilli.

Small Intestine.—A few tubercle bacilli.

CALF 594. Virus E. II.

Subcutaneous inoculation of culture derived from the lung of Calf 506

Dose—50 milligrammes.

Date of Inoculation—February 18, 1908. [Age 11 weeks.]

Died—March 5, 1908. [16 days after inoculation.]

Clinical History.

The animal showed symptons of slowly progressing broncho-pneumonia. It had diarrhœa and was thin.

Temperature.

Highest point reached 39·7° C. two days before death.

Weights.

	kilos.
February 18, 1908	58·50
March 5, 1908	51·69

Loss in weight.—6·81 kilos.

POST-MORTEM EXAMINATION.

General condition poor.

Local Lesion.—In the subcutaneous tissues on the left side of the neck there was a tumour measuring 11 by 7 by 3 cm. On section it was composed of congested grey tissue becoming opaque and necrosed towards the centre; it was adherent to the skin and muscle.

Prescapular Glands.—The left prescapular gland measured 6·5 by 3·5 by 1·5 cm. Almost half of the cortex was replaced by pinkish early caseated tissue; in the other half there were numerous small irregular early caseous patches.

The right prescapular gland measured 3·5 by 1·5 by ·8 cm. It was normal except for a minute opaque focus.

Prepectoral Glands.—Normal.

Cervical Glands.—The left inferior cervical gland was about 1·5 cm. in diameter and was composed throughout of pinkish necrotic tissue; it was connected to the local lesion by a caseous cord.

The left middle cervical gland contained early caseous firm patches in the cortex.

A second gland contained a fine caseous network at one part of the cortex.

Other cervical glands were normal.

Axillary Glands.—Normal.

Thorax.

Lungs.—The anterior lobes of both lungs and the right middle and anterior part of the right caudal lobes were dark reddish-grey and airless; on section muco-pus could be expressed from the bronchioles. In the rest of the lung there could be seen, just beneath the pleura, numerous minute irregular translucent foci a few of which were becoming opaque in the centre; on section through the substance a moderate number of similar foci could be seen.

Thoracic Lymphatic Glands.—The bronchial and mediastinal glands were slightly enlarged and firm. On section they were very oedematous. The long mediastinal gland showed an early caseous network in the cortex; several of the bronchial glands were similar.

Abdomen.

Spleen.—Weighed 141 grammes. Normal.

Liver.—On the surface just beneath the capsule could be seen fairly numerous minute grey tubercles. On section through the substance sparsely scattered grey points were visible.

Portal Glands.—The portal glands were oedematous and showed a few doubtful grey points.

Kidneys.—In the cortices of the kidneys a moderate number of grey points could be seen just beneath the surface, and on section a few in the substance.

Suprarenal Bodies.—In the cortex of the left there was a single grey point.

Lymphatic Glands.—One left iliac gland showed a doubtful grey focus.

The left parotid gland showed a few grey points.

Other organs and lymphatic glands appeared normal.

Note.—Early general tuberculosis. Death was premature and due to non-tuberculous broncho-pneumonia.

Microscopical Examinations.

(Smear preparations.)

Lung (crepitant).—Moderately numerous tubercle bacilli.

Lung (pneumonic).—A few tubercle bacilli.

Liver (focus).—Two tubercle bacilli seen.

Kidney (focus).—Two tubercle bacilli seen.

CALF 580. Virus E. II.

Subcutaneous inoculation of culture derived from the lung of Calf 504.

Dose—50 milligrammes.

Date of Inoculation—January 29, 1908. [Age 8 weeks.]

Died—February 27, 1908. [29 days after inoculation.]

Clinical History.

The animal was a small blind calf and was not very strong.

Temperature.

The temperature remained practically normal. The highest point reached 39·6° C. [14 days after inoculation.]

Weights.

	kilos.
January 29, 1908	41·72
February 27, 1908	33·55

Loss in weight.—8·17 kilos.

POST-MORTEM EXAMINATION.

General condition poor.

Local Lesion.—In the subcutaneous tissue on the left side of the neck there was a tumour 9 by 11 by 3 cm.; composed of slightly pinkish caseo-necrotic substance adherent to the skin and muscle and surrounded by a zone of congestion.

Prescapular Glands.—The left prescapular gland measured 9 by 5 by 3·5 cm.; it was composed throughout of firm caseo-necrotic tissue except for a small part of the medulla.

The right prescapular gland measured 5 by 2·5 by 1 cm. It was congested and contained discrete slightly irregular caseous tubercles up to a millet seed.

Prepectoral Glands.—The left prepectoral glands were congested and beset with small caseous patches and foci.

The right prepectoral, inferior cervical, middle and superior cervical and axillary glands were similar to the right prescapular gland.

The left inferior cervical gland, the size of a sparrow's egg, was caseous throughout, and connected to the local lesion by a caseous cord.

Thorax.

Pleura.—On the parietal pleura there were sparsely scattered flattened caseous nodules up to 1·5 mm. in size.

On each side of the diaphragm there were a few flattened fibro-caseous nodules up to 2·5 mm. in diameter.

Lungs.—The lungs did not collapse normally; they were oedematous and deeply congested, the left sank in water. The substance was closely filled with more or less discrete caseating tubercles up to a millet seed in size. They were individually surrounded by zones of congestion which in places becoming confluent formed congested patches beset with tubercles.

Thoracic Lymphatic Glands.—The long mediastinal gland measured 9·5 by 3 by 2 cm.; it was congested and the margins of the cortex were replaced by firm caseated tissue.

The other mediastinal glands were similar but less severely affected.

The bronchial glands resembled the mediastinal gland.

The glands within the entrance to the thorax were beset with discrete caseous tubercles.

The sternal glands resembled the right prescapular gland.

Abdomen.

Omentum.—The omentum showed numerous flattened slightly congested tubercles.

Mesenteric Glands.—Many of the mesenteric glands were enlarged and oedematous; the cortices were beset with a moderate number of slightly irregular discrete caseating submiliary tubercles, most numerous just beneath the capsule.

The gastric and colic glands were similar.

Spleen.—The spleen weighed 453 grammes. The substance was packed with caseating nodules varying up to a hemp seed in size, the majority resembling millet seeds.

Liver.—Evenly distributed throughout the substance were numerous discrete caseating tubercles varying from a point to about a millet seed in size; the majority were slightly irregular and about the size of rape seed.

Beneath the mucous membrane of the gall bladder there were a few caseous tubercles up to a rape seed in size.

Portal Glands.—The cortices of the portal glands showed the margins almost replaced by confluent caseous tubercles and nodules; in the deeper parts of the cortex the tubercles were discrete.

Kidneys.—The kidneys showed, scattered throughout the cortices, moderately numerous caseating tubercles up to a millet seed in size.

Suprarenal Bodies.—The right suprarenal body contained one tubercle the size of a rape seed.

Various Lymphatic Glands.

The Renal, Lumbar, Iliac, Submaxillary, Parotid, Popliteal, and Sciatic Glands were beset with discrete irregular caseous tubercles not larger than a millet seed.

The Tonsils contained discrete caseous submiliary tubercles and there were similar tubercles in the mucous membrane of the naso-pharynx.

The Pharynx was congested and beneath the mucous membrane was seen an occasional caseous tubercle.

CALF 578. Virus E. II.

Subcutaneous inoculation of culture derived from the lung of Calf 504.

Dose—50 milligrammes.

Date of Inoculation—January 29, 1908. [Age 8 weeks.]

Killed—April 28, 1908. [90 days after inoculation.]

Clinical History.

The animal remained in fair condition. It had some difficulty in breathing which became more marked half-way through the experiment.

Temperature.

The temperature remained normal throughout.

Weights.

	kilos.
January 29, 1908	68·02
April 28, 1908	67·11

Total loss in weight.—0·91 kilos.

POST-MORTEM EXAMINATION.

Carcass in fair condition.

Local Lesion.—At the seat of inoculation in the subcutaneous tissue on the left side of the neck there was an oval tumour measuring 10 by 6 by 3 cm.; it was adherent to the skin and muscle but did not infiltrate them. On section it consisted of firm pinkish caseo-necrotic tissue with an opaque gritty margin around the periphery.

Prescapular Glands.—The left prescapular gland measured 8 by 4·5 by 3 cm. On section it was almost entirely replaced by tissue resembling the local lesion with a similar collection of calcareous grains arranged around the margins.

The right prescapular gland measured 4·5 by 2 by 1 cm. On section it contained a single soft caseous miliary tubercle.

Prepectoral Glands.—The left reniform prepectoral gland contained minute discrete caseous foci.

The other prepectoral glands were normal.

Cervical Glands.—The left inferior cervical gland was slightly enlarged and about half the cortex was replaced by caseo-calcareous tissue.

The rest of the cervical glands contained an occasional opaque focus.

Axillary Glands.—Normal.

Thorax.

Pleura.—On the parietal pleura along the ribs there were numerous thin flat translucent growths, the majority small, the largest measuring 1 by 1·5 cm.

There were similar growths on the central tendon of the diaphragm and on the visceral pleura.

There were some small translucent growths on the pericardium.

Lungs.—The lungs did not collapse normally. The parenchyma contained numerous discrete irregular reddish-grey patches; the majority were small and they were most numerous and largest at the posterior extremities. On section these areas, or pneumonic lobules, were beset with yellowish irregular caseo-calcareous granules which were easily picked out.

Mediastinal Glands.—The caudal mediastinal gland measured 12·5 by 3 by 1·8 cm. On section the cortex was firm from the presence of ill-defined nodules of grey translucent tissue, in which were scattered minute calcareous foci. The cortices of the other mediastinal glands were firm translucent and beset with calcareous foci and small caseo-calcareous tubercles.

The ventral mediastinal glands each contained a few yellowish rape-seed sized tubercles, some softened and caseous, others caseo-calcareous.

Bronchial Glands.—The bronchial glands were a little enlarged and resembled the mediastinal glands.

Heart and Great Vessels.—Normal.

Abdomen.

Omentum.—On the omentum there were scattered translucent nodules up to nearly a hemp seed in size, a few of which were very slightly opaque in the centre.

Intestines.—The majority of the Peyer's patches contained from one to six soft yellow nodules up to a millet seed in size. Beneath the mucous membrane of the large intestine there were fairly numerous similar nodules.

Gastric Glands.—The gastric glands were beset with caseo-calcareous foci.

Mesenteric Glands.—Many of the mesenteric glands were somewhat enlarged, the cortices were firmer than normal and were beset with irregular caseo-calcareous granules, in parts aggregated into areas, and in parts discrete.

The ileo-colic glands were similar.

Spleen.—The spleen weighed 198 grammes. On section it contained moderately numerous opaque yellowish tubercles, varying up to a millet seed in size, but the majority were the size of rape seed. A few projected slightly from beneath the capsule, and to them were attached little fringes of fibrin.

Liver.—The surfaces of the liver appeared normal, and on section through the substance there were sparsely scattered minute grey foci (nine counted in thin section).

Portal Glands.—The portal glands showed their cortices beset with fairly numerous minute calcareous grains easily picked out of the substance.

Kidneys.—Just beneath the capsule of the kidneys there was a moderate number of grey translucent tubercles varying up to about a millet seed in size. On section these tubercles in a majority of cases contained exceedingly minute opaque foci.

Suprarenal Bodies.—The left suprarenal body contained a caseo-calcareous miliary tubercle.

The right suprarenal body contained two caseating nodules.

Abdominal Lymphatic Glands.—The coeliac glands resembled the portal glands.

The lumbar glands contained a few tubercles similar to those in the portal glands.

In the iliac glands there were four minute caseo-calcareous tubercles.

Tongue, Tonsils, Larynx, Pharynx, and Trachea.—Normal.

Various Lymphatic Glands.

The Submaxillary and Parotid Glands resembled the superior cervical glands.

The Posterior Pharyngeal Glands contained a moderate number of caseo-calcareous tubercles, the largest the size of rape seed.

The right precrural gland contained three soft caseous tubercles and the left, one.

In the right popliteal gland there was a minute opaque focus.

Each pudic gland contained a softening caseous miliary tubercle.

Microscopical Examinations.

(Smear preparations.)

Lung (granule).	—A few scattered tubercle bacilli.
Liver (focus) ...	No tubercle bacilli.
Kidney (tubercle) ...	
Mediastinal Gland (translucent tissue).	
Pleural Growth ...	
Mesenteric Gland (translucent tissue).	
Small Intestine (tubercle)	
Large Intestine (tubercle)	

CALF 626. Virus E. II.

Subcutaneous inoculation with culture derived from the prescapular gland of Calf 504.

Dose—50·0 milligrammes.

Date of Inoculation—April 3, 1908. [Age 11 weeks.]

Died—May 27, 1908. [54 days after inoculation.]

Temperature.

The temperature slowly rose, reaching 40·2° C. on the 30th day, after which it gradually fell until the calf died.

Weights.

	kilos.
April 3, 1908	50·79
May 27, 1908	42·62

Loss in weight.—8·17 kilos.

POST-MORTEM EXAMINATION.

Carcass in poor condition.

Local Lesion.—In the subcutaneous tissue on the left side of the neck there was a pear-shaped tumour measuring 11 by 7·5 by 3 cm. It was adherent to the skin and muscle, the former of which was intact. On section it consisted of yellowish-white necrotic tissue, firm except at one extremity where a cavity was formed ; it was surrounded by a margin of congestion.

Prescapular Glands.—The left prescapular gland measured 7 by 4 by 3·2 cm. On section the cortex was entirely replaced by firm slightly pink necrotic tissue.

The right prescapular gland measured 4·5 by 2 by ·7 cm. On section it was congested and contained a few yellow caseous nodules up to a hemp seed.

Prepectoral Glands.—The left reniform gland contained numerous discrete caseous tubercles.

The left round prepectoral gland, the size of a pea, was similar.

The right prepectoral glands contained firm irregular caseous nodules.

Cervical Glands.—The left inferior cervical glands were slightly enlarged and congested and the cortices were studded with caseous tubercles confluent in parts.

The left middle cervical glands were small, but contained numerous tubercles the size of rape seed.

The left superior cervical glands contained discrete caseous tubercles up to a hemp seed.

The cervical glands on the right side resembled the right prepectoral glands.

The axillary and parotid glands were also similarly affected.

Thorax.

Lungs.—The lungs were heavy and congested ; the anterior lobes were reddish-grey, solid and airless. The lung substance was closely filled with irregular caseous nodules, and many lobules were pneumonic and partly caseous. The bronchi contained muco-pus.

Mediastinal Glands.—The caudal mediastinal gland measured 10 by 4 by 2 cm., it was firm, and on section about half the cortex was replaced by confluent waxy caseous nodules.

The other mediastinal and bronchial glands were enlarged and resembled the caudal mediastinal gland.

Heart.—Normal.

Abdomen.

Diaphragm.—On the peritoneal surface of the diaphragm there were two flattened fibro-caseous tubercles.

Omentum.—In the omentum there were a few congested miliary tubercles.

Intestines.—All the Peyer's patches contained soft yellow caseous nodules varying up to nearly a hemp seed in size ; they were most numerous in the terminal patch. There were also similar nodules beneath the mucous membrane.

In the large intestine the follicles contained similar nodules.

Mesenteric Glands.—The mesenteric glands were firm and the cortices were partly replaced by confluent waxy caseous nodules.

Spleen.—The spleen weighed 226 grammes. It was congested and showed on the surface one loosely attached fibrous tubercle. On section it contained fairly numerous caseous tubercles up to about 1 mm. in diameter.

Liver.—The liver substance was dark red in colour. On the convex surface, just beneath the capsule, there were two translucent submiliary tubercles with opaque centres. On the concave surface, in a small area, there was a group of twenty similar tubercles projecting slightly above the surface ; on the rest of that surface there were two tubercles. Numerous sections through the substance revealed no more tubercles.

Gall Bladder.—Two minute opaque tubercles in the wall of the gall bladder.

Portal Glands.—The portal glands were enlarged and firm and the cortices were to a large extent replaced by caseating tissue.

Kidneys.—In the cortices of the kidneys, mainly in the deeper portions, there were some sparsely scattered minute caseating tubercles.

Suprarenal Bodies.—Normal.

Abdominal Lymphatic Glands.—The renal glands were enlarged and the cortices were composed of firm caseating tissue.

The coeliac glands were closely filled with caseous nodules.

The lumbar and iliac glands contained moderately numerous irregular caseous nodules up to a wheat grain in size.

Tongue.—Normal.

Tonsils.—The tonsils contained a few yellow caseous nodules.

The pharynx and larynx were congested. On the latter there were a few minute ulcers with caseous floors and congested margins.

Various Lymphatic Glands.

The Submaxillary and Retro-pharyngeal Glands were fairly closely filled with caseous nodules.

The Precrural and Pudic Glands were beset with caseous nodules up to a wheat grain in size.

The Popliteal, Sciatic, and Ischiatic Glands contained discrete caseous nodules.

CALF 640. Virus E. II.

Subcutaneous inoculation with culture derived from the prescapular gland of Calf 598.

Dose—50 milligrammes.

Date of Inoculation—May 29, 1908. [Age 12 weeks.]

Killed when in good general health—September 1, 1908. [95 days after inoculation.]

Clinical History.

There was no disturbance of health during the experiment.

Temperature.

The temperature remained normal throughout the experiment.

Weights.

	kilos.
May 29, 1908	53·96
September 1, 1908	92·06

Total gain in weight.—38·10 kilos.

POST-MORTEM EXAMINATION.

General condition good.

Local Lesion.—At the seat of inoculation in the subcutaneous tissues on the left side of the neck there was a tumour measuring 12 by 5 by 4·5 cm. On section it was a fibrous walled cyst filled with caseo pus.

Prescapular Glands.—The left prescapular gland measured 8 by 5·5 by 3·5 cm. On section the gland was almost entirely replaced by softening caseous substance.

The right prescapular gland measured 4 by 2 by 1 cm. On section it was normal.

Prepectoral Glands.—The left reniform prepectoral gland contained a caseous miliary tubercle.

The other prepectoral glands were normal.

Cervical Glands.—The left inferior cervical gland measured 1 cm. in diameter and on section was more than half replaced by yellow caseous substance.

The left middle cervical gland was beset with caseous nodules.

The right middle cervical gland contained a pea-sized softening caseous nodule.

The left superior cervical gland showed a caseous miliary tubercle.

Thorax.

Lungs.—In the lungs just beneath the pleura there were a few minute opaque calcareous granules. In the margin of the right anterior lobe there was a pea-sized nodule consisting of soft yellow caseous substance within a fibrous capsule.

In the left lung there were counted just beneath the pleura seven caseating tubercles up to a hemp seed in size.

Thoracic Lymphatic Glands.—The mediastinal and bronchial glands were fairly closely beset with caseous nodules with grey margins, varying up to a small pea in size, the majority being the size of hemp seed.

A gland on the left side just within the entrance to the thorax was enlarged and composed entirely of softening caseous substance.

Abdomen.

Mesenteric Glands.—Five of the mesenteric glands contained from one to six caseous nodules which varied up to a small pea in size.

Spleen.—In the spleen there were scattered softening yellow caseous gritty nodules (about 24 counted), varying from a rape seed to a pea in size.

Liver.—Normal.

Portal Glands.—The portal glands showed a moderate number of caseous gritty tubercles up to a millet seed in size.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

The coeliac glands showed a few tubercles similar to those in the portal glands.

Two lumbar glands contained caseous nodules with grey margins up to a hemp seed in size.

The left posterior pharyngeal gland contained a caseating nodule the size of a wheat grain.

All other organs and glands appeared normal.

CALF 618. Virus E. II.

Subcutaneous inoculation of culture derived from the spleen of Calf 590.

Dose—50 milligrammes.

Date of Inoculation—April 29, 1908. [Age about 8 weeks.]

Killed when in good general health—July 22, 1908. [84 days after inoculation.]

Temperature.

The temperature remained normal throughout.

Weights.

	kilos.
April 29, 1908	38·54
July 22, 1908	58·49

Total gain in weight.—19·95 kilos.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—In the subcutaneous tissue at the seat of inoculation on the left side of the neck, there was a prominent tumour the size of a hen's egg. On section it was a cyst with fibrous walls, crossed by fibrous trabeculae, and containing soft yellow caseo-necrotic substance.

Prescapular Glands.—The left prescapular gland measured 5·2 by 3·3 by 1·6 cm. On section it contained two cystic nodules with grey translucent gritty margins filled with caseo-purulent substance, the largest being 1 cm. in diameter.

There was no tuberculosis elsewhere in the body.

CALF 598. Virus E. II.

Subcutaneous inoculation of culture derived from the prescapular gland of Calf 404.

Dose—50 milligrammes.

Date of Inoculation—February 12, 1908. [Age 10 weeks.]

Killed when in good general health—May 13, 1908. [91 days after inoculation.]

Temperature.

The temperature remained normal throughout the experiment.

Weights.

	kilos.
February 12, 1908	50·79
May 13, 1908...	70·29

Total gain in weight.—19·50 kilos.

Tuberculin Test.

March 10, 1908. [27 days after inoculation.] Dose of tuberculin (bovine), 3·0 cc. Rise of temperature, ·3° Centigrade.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—At the seat of inoculation in the subcutaneous tissue on the left side of the neck there was a rounded slightly prominent tumour 6 cm. in diameter, and 3 cm. in thickness ; it was cystic and on section contained yellowish muco-purulent caseous substance.

Prescapular Glands.—The left prescapular gland measured 5 by 2·4 by 1 cm. On section it showed a small area containing a collection of confluent caseo-calcareous tubercles, which towards the centre had become soft and caseo-purulent.

The right prescapular gland measured 4·7 by 2 by 1 cm. On section it was normal.

Cervical Glands.—A left inferior cervical gland was very slightly enlarged and replaced by caseo-calcareous tissue.

Liver.—In the liver, just beneath the capsule, there were two or three minute opaque foci.

Iliac Glands.—One iliac gland contained a few opaque foci. A second iliac gland showed some soft whitish chalky substance, mainly in the pelvis.

There was no tuberculosis elsewhere.

Microscopical Examinations.

(Smear preparations.)

Local Lesion.—Numerous tubercle bacilli.

Prescapular Gland.—Numerous tubercle bacilli.

Liver (focus).—One tubercle bacillus.

Iliac Gland (focus).—A few tubercle bacilli.

CALF 648. Virus E. II.

Subcutaneous inoculation with culture derived from the prescapular gland of Calf 600.

Dose—50 milligrammes.

Date of Inoculation—August 4, 1908. [Age about 5 months.]

Killed when in good general health—October 26, 1908. [83 days after inoculation.]

Temperature.

The temperature rose to 39·8 on the 17th day, after which it fluctuated, reaching 40·0° C. on the 24th and 40·3° C. on the 33rd. It subsequently slowly fell and remained normal until the animal was killed

Weights.

	kilos.
August 4, 1908	103·39
October 26, 1908	160·08

Total gain in weight.—56·69 kilos.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—At the seat of inoculation in the subcutaneous tissues on the left side of the neck there was a pear-shaped tumour 15 cm. long, and 8 cm. in greatest width. On section it was found to be adherent to the skin and was 3 cm. in thickness. It was composed of translucent fibrous tissue beset with softening caseous gritty nodules. In the skin over the tumour there was a depression, at the bottom of which were two ulcers communicating with a small cavity which contained a little caseo-pus.

Prescapular Glands.—The left prescapular gland measured 9·3 by 4·5 by 4 cm. On section it contained two pinkish caseo-necrotic masses softening in the centre which replaced the greater part of the gland.

The right prescapular gland measured 7 by 3·2 by 1·6 cm. On section it contained a single grey nodule the size of a hemp seed beset with opaque foci.

Cervical Glands.—The left inferior cervical gland measured 1 by ·7 cm., and was composed entirely of softened caseous substance.

A left middle cervical gland contained two patches of grey tissue beset with caseous streaks and foci.

Spleen.—On close inspection of the spleen pulp a number of the Malpighian bodies showed minute central opacities.

Liver.—In the liver a few scattered grey foci were seen.

There was no tuberculosis elsewhere.

Microscopical Examinations.

(Smear preparations.)

Spleen (Malpighian body I.).—No tubercle bacilli seen.

Spleen (Malpighian body II.).—No tubercle bacilli seen.

Liver (focus).—No tubercle bacilli seen.

CALF 638. Virus E. II.

Subcutaneous inoculation of culture derived from the lung of Calf 596

Dose—50 milligrammes.

Date of Inoculation—June 10, 1908. [Age 8 weeks.]

Killed when ill but not dying—July 20, 1908. [40 days after inoculation.]

Weights.

	kilos.
June 10, 1908	50·79
July 20, 1908	42·62

Loss in weight.—8·17 kilos.

POST-MORTEM EXAMINATION.

Carcass in poor condition.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a pear-shaped tumour measuring 13 by 9 by 4·5 cm.; the skin over it was intact. On section it was composed of pinkish-yellow caseo-necrotic tissue in the centre of which was an irregular cavity 6 cm. in length, filled with a yellow fluid containing caseous flakes.

Prescapular Glands.—The left prescapular gland measured 10 by 5·5 by 4 cm.; it was firm and on section was replaced by a dense fibrous pinkish-yellow caseo-necrotic tissue.

The right prescapular gland measured 6 by 3 by 1·8 cm. On section the cortex showed a number of yellow caseous nodules up to a centimetre in diameter.

Prepectoral Glands.—The left reniform gland was about half replaced by firm yellow caseous tissue.

The left rounded gland was similar.

The right prepectoral glands, the size of peas, each showed one yellow caseous nodule in the cortex.

Cervical Glands.—Two left inferior cervical glands, the size of marbles, showed half their cortices replaced by a greyish-yellow caseous network.

The right inferior cervical glands, two in number, showed a few yellow caseous nodules up to 3 mm. in diameter.

The superior and middle cervical glands on both sides showed numerous irregular discrete grey nodules up to 1 cm. in diameter with a yellow network of caseous foci.

Axillary Glands.—The axillary glands contained a moderate number of irregular yellowish caseating nodules.

Thorax.

Pleura.—Along the margins of the ribs there were moderately numerous clusters of reddish-grey tubercles up to 2 mm. in diameter, the largest having opaque centres; there were also a few loosely attached flattened grey nodules with a faint caseous network.

The pleural surface of the diaphragm showed some tubercles and nodules similar to those on the ribs.

Lungs.—The lungs did not collapse normally; they were heavy, congested and oedematous, the cephalic lobes just floating in water. The parenchyma was closely filled with confluent caseating nodules with opaque caseous centres, the largest measuring 3 mm. in diameter, the majority being about 1·5 mm. On section whole nodules were found, reddish-grey in colour, with a yellow caseous network throughout.

Muco-pus could be expressed from the larger bronchi.

Thoracic Lymphatic Glands.—The caudal mediastinal gland measured 13 by 5·5 by 3 cm. and on section the cortex was almost entirely replaced by firm greyish-yellow caseo-necrotic tissue.

The other mediastinal and bronchial glands were enlarged and similarly affected.

Heart.—In the heart muscle there was one greyish yellow caseous nodule the size of a hemp seed.

Abdomen.

Omentum.—The omentum showed a moderate number of grey and reddish-grey loose attached nodules up to 3 mm. in diameter with caseous foci.

Intestines.—Along the whole length of the small intestine, both in the mucous membrane and the Peyer's patches, there were numerous yellow caseous tubercles up to a hemp seed in size.

The mucous membrane of the large intestine showed numerous small yellow caseous tubercles.

Mesenteric Glands.—The mesenteric glands were all enlarged and showed their cortices extensively replaced by a firm yellow necrotic network.

Gastric and colic glands resembled the mesenteric glands.

Spleen.—The spleen weighed 283 grammes. On the surface there were a few reddish-grey tubercles with opaque foci. On section the pulp was closely filled with greyish-yellow caseous tubercles the largest 2 mm. in diameter, the majority being 1·5 mm.

Liver.—The liver was a little pale. On the surface beneath the capsule there were numerous grey translucent tubercles and nodules up to 2·5 mm. in diameter. The smallest, of which many were mere points, were grey and translucent, the largest were greyish and opaque; the majority projected above the surface.

On section there were numerous grey tubercles with opaque centres up to a pin head in size.

Gall Bladder.—Normal.

Portal Glands.—The portal glands were enlarged and the cortices were extensively replaced by a firm coarse network of yellow caseous tissue.

Kidneys.—The cortices of the kidneys showed fairly numerous grey tubercles and nodules up to 3 mm. in diameter with caseous centres.

Suprarenal Bodies.—Normal.

Tongue.—At the root of the tongue there were two rape seed sized caseous tubercles.

There was a small congested focus in the trachea.

Tonsils.—There was a moderate number of yellow caseous nodules in the tonsils.

Various Lymphatic Glands.

The Coeliac, Renal, and Lumbar Glands were greatly enlarged and showed their cortices filled with a greyish-yellow firm caseated network.

Iliac, Pudic, Precrural, Submaxillary and Parotid Glands showed numerous irregular discrete grey nodules up to 1 cm. in diameter with a network of caseous foci.

The Posterior Pharyngeal Glands were enlarged and showed a considerable part of their cortices replaced by firm greyish-yellow caseated tissue.

CALF 600. Virus E. II.

Subcutaneous inoculation with culture derived from the mediastinal gland of Calf 406.

Dose 50·0 milligrammes. [Age about 14 weeks.]

Date of Inoculation—February 18, 1908.

Killed when in good general health—July 3, 1908. [136 days after inoculation.]

Temperature.

The temperature remained normal during the experiment.

Weights.

	kilos.
February 2, 1908	53·96
July 3, 1908	61·21

Gain in weight.—7·25 kilos.

POST-MORTEM EXAMINATION.

General condition good.

Local Lesion.—At the seat of inoculation in the subcutaneous tissue on the left side of the neck, there was a slightly prominent oval tumour measuring 8 by 5·5 by 3·5 cm. The skin over it was intact. On section it was found to be a tense cyst filled with thick yellow muco-pus, and with smooth grey translucent walls.

Prescapular Glands.—The left prescapular gland measured 5 by 2·5 by 1·3 cm. On section it showed just beneath the capsule, a single pea-sized nodule filled with soft caseous gritty substance.

The right prescapular gland measured 5·5 by 2·2 by 1·3 cm. On section it was normal.

Prepectoral Glands.—Normal.

Cervical Glands.—The left inferior cervical gland was the size of a sparrow's egg. It was found on section to be a cyst filled with muco-pus.

Other cervical glands were normal.

Liver.—On the surface of the liver, beneath the capsule, there were sparsely scattered minute irregular opaque foci.

Lumbar Glands.—In the cortex of a lumbar gland, just beneath the capsule, there was a number of minute irregular caseous foci. Other organs and lymphatic glands showed no tuberculosis.

Microscopical Examinations.

(Smear preparations.)

Liver (tubercle I.).—Two tubercle bacilli seen.

Liver (tubercle II.). No tubercle bacilli seen.

Lumbar Gland.—Four tubercle bacilli seen.

CALF 596. Virus E. II.

Subcutaneous inoculation of culture derived from the prescapular gland of Calf 406.

Dose—50 milligrammes.

Date of Inoculation—February 18, 1908. [Age 11 weeks.]

Killed in good general health—May 18, 1908. [90 days after inoculation.]

Clinical History.

There was no sign of ill-health during the experiment.

Temperature.

The temperature remained normal during the experiment.

Weights.

	kilos.
February 18, 1908	53·96
May 18, 1908	63·49

Total gain in weight.—9·53 kilos.

POST-MORTEM EXAMINATION.

General condition good.

Local Lesion.—In the subcutaneous tissues on the left side of the neck there was an oval slightly prominent tumour measuring 9 by 5 by 2·5 cm. On section it was a fibrous-walled non-infiltrating cyst, with ragged caseous walls internally, and containing a straw-coloured serous fluid with caseous flakes.

Prescapular Glands.—The left prescapular gland was enlarged, measuring 9 by 5·2 by 4·5 cm.; the periglandular tissues were oedematous. On section it was almost entirely replaced by yellow caseous gritty tissues, partly homogeneous, and partly contained in a matrix of translucent tissue.

The right prescapular gland measured 4 by 1·8 by 1 cm. On section it was normal.

Prepectoral Glands.—A left prepectoral gland was slightly enlarged and contained firm yellow caseous patches, replacing nearly half the cortex.

Other prepectoral glands were normal.

Cervical Glands.—Normal.

Thorax.

Pleura.—There were a few fibro-caseous nodules in the lymphatic fringes along the ribs and on the pleural surface of the diaphragm, the largest measuring 9 by 4 mm. There was one on the pericardium.

Lungs.—The lungs collapsed well and were crepitant but slightly oedematous. Scattered throughout the substance of all the lobes was a moderate number of congested caseating nodules, varying from a rape seed up to a nodule 1 cm. in diameter; there were also a few dark-red lobules without any sign of caseation.

Thoracic Lymphatic Glands.—The caudal mediastinal gland was enlarged and measured 9·5 by 4 by 2 cm. It was firm and on section the cortex was closely filled by grey nodules with yellow caseating centres.

The other mediastinal and bronchial glands were enlarged and the cortices almost entirely replaced by firm caseating tissue resembling that in the caudal mediastinal gland.

The tissues of the dorsal mediastinum were oedematous.

Abdomen.

Omentum.—In the omentum there were two loosely attached submiliary fibrous tubercles with opaque centres.

Peritoneum.—On the parietal peritoneum on the left side, there was a group of loosely attached fibroid translucent tubercles varying up to about a millet seed in size.

Intestines.—In the long Peyer's patch there was a moderate number of softening yellow caseous nodules, up to about a millet seed. In the other Peyer's patches an occasional tubercle was seen.

Large Intestine.—Normal.

Mesenteric Glands.—Normal.

Spleen.—The spleen weighed 169 grammes. On the surface, attached by a fibrous fringe, there was a caseous nodule 5 mm. in diameter. On section there was a single caseous nodule 2 mm. in diameter.

Liver.—In the liver there were four caseating nodules varying from a rape seed up to a pea in size.

Portal Glands.—Two portal glands contained three small firm yellow caseous patches, the rest were normal.

Kidneys.—Both kidneys showed petechial haemorrhages just beneath the surfaces of the cortices. In the right there was a single ill-defined translucent tubercle with a minute opaque centre.

Suprarenal Bodies.—Each suprarenal body contained in the cortex discrete caseating tubercles up to 2 mm. in diameter.

There was no tuberculosis of any other organ or gland.

Microscopical examinations of smear preparations made from the lung and mediastinal gland showed moderately numerous tubercle bacilli.

VIRUS E. IV.

CALF PASSAGE EXPERIMENTS.

PASSAGE *a*.

CULTURE.

Derived from the original material through a guinea-pig. Total duration of artificial cultivation, 115 days. Inoculated April 30, 1906.

CALF 408.

Subcutaneous.
Dose : 10·0 mg.
Killed . August 17, 1906.
109 days.
P.M.—Local tuberculosis only.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
845	Intrav.	1·0 mg	D. 19 days	Acute G. T
844	Intrav.	0·1 mg.	D. 23 ,,	Acute G. T
847	Subcut.	1·0 mg.	K. 112 ,,	Local T. and five tubercles in lung.
849	Subcut.	0·1 mg.	K. 112 ,,	Local T. and six tubercles in lung.

CULTURE.

Derived from the prescapular gland.

The 14th generation was inoculated on January 30, 1908, after the strain had been 531 days in artificial cultivation, into :

CALF 582.

Subcutaneous.
Dose : 50·0 mg.
Killed : April 27, 1908.
88 days.

P.M.—Fibro-caseous local lesion. The left prescapular gland was extensively caseo-necrotic. The liver and lungs contained a moderate number of grey tubercles; the spleen contained moderately numerous miliary grey tubercles with soft caseating centres.

CULTURE.

Derived from the spleen. The 3rd generation was inoculated on May 25, 1908; the total duration of artificial cultivation was 28 days.

CALF 636.

Subcutaneous.
Dose : 50·0 mg.
Killed : August 31, 1908.
98 days.

P.M.—Cyst containing caseo-pus at seat of inoculation. Adjacent glands enlarged and caseo-necrotic. The thoracic glands contained a moderate number of caseous tubercles and nodules : many abdominal glands contained one or more caseous tubercles and opaque foci. One or two tubercles were seen in the spleen and one kidney.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1778	Intrav	0·1 mg.	D. 29 days	Acute G. T.
1776	Intrav	0·01 mg.	D. 107 ,,	Chronic G. T
1775	Subcut.	10·0 mg.	K. 164 ,,	Local T. and T. of lungs and kidneys
1777	Subcut.	10·0 mg.	D. 72 ,	G. T.

CALF 584.

Subcutaneous.
Dose : 50·0 mg.
Killed : May 7, 1908.
98 days.

P.M. — Fibrous-walled cyst filled with caseous substance at seat of inoculation. Left prescapular gland extensively caseo-necrotic and softened. There were a few minute foci in the liver, kidneys, and thoracic glands; the suprarenals showed many grey miliary caseating tubercles.

CULTURE.

Derived from the suprarenal body. The 3rd generation was inoculated on May 29, 1908; total duration of artificial cultivation, 22 days.

CALF 642.

Subcutaneous.
Dose : 50·0 mg.
Killed : September 2, 1908.
96 days.

P.M.—Small fibrous-walled cyst at seat of inoculation Caseous gritty collections of tubercles occupied half the left prescapular gland. In the spleen about 20 Malpighian bodies were caseous in the centre, each suprarenal contained two caseous nodules; one mediastinal and a few mesenteric glands contained opaque foci.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1780	Intrav.	0·1 mg	D. 21 days	Acute G. T.
1782	Intrav.	0·01 mg	D. 37 ,,	G. T.
1781	Subcut.	50 0 mg	D. 157 ,,	G. T. not severe. ? cause of death.
1779	Subcut.	10·0 mg.	K 161 ,,	Slight retrogressive T.

RABBITS.

—	Number.	Method.	Dose.	Duration of Life.	Result.
July 3, 1907, 8th generation of culture.	1381	Intrav	1·0 mg.	D. 79 days	G. T.
	1380	Intrav.	0·1 mg.	D. 75 ,,	G. T.
	1383	Subcut.	10·0 mg.	D. 203 ,,	Severe chronic G. T.
	1382	Subcut.	1·0 mg.	D. 297 ,,	Chronic G. T., severe in lungs.
January 30, 1908, 14th generation of culture.	1620	Intrav.	1·0 mg.	D. 20 days	Acute T.
	1619	Intrav	0·1 mg.	D. 126 ,,	Chronic G. T.
	1618	Intrav	0·01 mg.	D. 95 ,,	G. T.
	1621	Subcut.	1·0 mg.	K. 217 ,,	Slight chronic T.
July 23, 1908, 11th generation of culture.	1845	Intrav	1·0 mg.	D. 17 ,,	Acute T.
	1846	Intrav.	1·0 mg.	D. 47 ,,	G. T.

RHESUS MONKEY 220.

Subcutaneous.
Dose 1·0 mg. of culture of the 11th generation, inoculated on July 23, 1908.
Killed (when well) : October 27, 1908.
96 days.

P.M. — Ulcerated caseo-necrotic local tumour. Several of the neighbouring glands were caseous and softened. The lungs and kidneys contained a moderate number of miliary tubercles, the larger with caseous centres; the spleen showed numerous caseo purulent nodules at one place confluent.

VIRUS E. IV.—*continued.*

CALF PASSAGE EXPERIMENTS—*continued.*

PASSAGE β.

CULTURE.

Derived from the original material through a guinea-pig. Total duration of artificial cultivation 390 days. Inoculated on January 30, 1907.

CALF 498.

Subcutaneous.

Dose : 50·0 mg.

Died : April 29, 1907.

89 days.

P.M.—Tuberculosis of lungs, suprarenal bodies, thoracic and abdominal glands and intestines. One tubercle in heart and one in spleen.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1219	Intrav.	1·0 mg.	D. 14 days	Acute T.
1218	Subcut.	20·0 mg.	D. 35 „	G. T.
1217	Subcut.	10·0 mg.	D. 150 „	Local T. and T. of lungs and kidneys.
1216	Subcut.	1·0 mg.	D. 154 „	Local T. and T. of lungs, kidneys, and thyroid body.

CULTURE.

Derived from the lung.

CALF 586.

Subcutaneous.

Dose : 50·0 mg. of culture of the 4th generation, inoculated on February 5, 1908.

Died (of pneumonia) : March 12, 1908.

36 days.

P.M.—Fibro-caseous local tumour. The left prescapular gland showed four diffusely caseous nodules ; two cervical glands were diffusely caseous. Each kidney showed a few greyish wedge-shaped patches, and each suprarenal minute grey foci. One lumbar gland showed two grey foci. T.B. were seen in smears from a mesenteric gland.

RABBITS.

—	Number.	Method.	Dose.	Duration of Life.	Result.
July 10, 1907, 4th generation of culture.	1389	Intrav.	1·0 mg.	D. 30 days	Acute G. T.
	1388	Intrav.	0·1 mg.	D. 62 „	G. T. moderately severe.
	1391	Subcut.	8·0 mg.	D. 106 „	Slight T. Cause of death not apparent.
	1390	Subcut.	1·0 mg.	D. 324 „	Severe chronic G.T.

CULTURE.

Derived from the mediastinal gland. The 4th generation was used for inoculation on May 19, 1908 ; the total duration of artificial cultivation was 104 days.

CALF 634.

Subcutaneous.

Dose : 50·0 mg

Killed : August 31, 1908.

104 days.

P.M.—The local lesion was a fibrous-walled cyst filled with caseo-purulent substance. The left prescapular and cervical glands contained each one or two soft caseous nodules. The liver contained a few yellowish foci, and in the portal glands an occasional minute focus was seen.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1766	Intrav.	1·0 mg.	D. 25 days	Acute T.
1769	Intrav.	0·1 mg.	D. 41 „	Acute T.
1767	Subcut.	50·0 mg.	D. 86 „	G. T.
1768	Subcut.	10·0 mg.	D. 114 „	Slight T. (?) cause of death.

CALF 588.

Subcutaneous.

Dose : 50·0 mg. of culture of the 4th generation, inoculated on February 5, 1908.

Killed : May 5, 1908.

90 days.

P.M.—Local tuberculosis only.

CULTURE.

Derived from the prescapular gland. The 3rd generation was used for inoculation on May 29, 1908 ; the total duration of artificial cultivation was 24 days.

CALF 644.

Subcutaneous.

Dose : 50·0 mg.

Killed : September 1, 1908.

95 days.

P.M.—The local tumour was composed of firm caseous gritty tissue beginning to break down. The left prescapular gland was extensively replaced by caseo-necrotic substance. There were fairly numerous irregular yellowish foci in the mediastinal glands. There was a grey tubercle in the heart, and a caseating nodule in each suprarenal. In the spleen many Malpighian bodies contained soft yellow gritty centres. A few minute foci were seen in the portal glands.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1789	Intrav.	0·1 mg.	D. 24 days	Acute G. T.
1790	Intrav.	0·01 mg.	D. 87 „	Chronic G. T.
1787	Subcut.	50·0 mg.	D. 61 „	Slight T. Death from sepsis.
1788	Subcut.	10·0 mg.	D. 158 „	Slight T. (?) cause of death.

CULTURE.

Derived from the bronchial gland.

—	Number.	Method.	Dose.	Duration of Life.	Result.
Feb. 5, 1908, 4th generation of culture.	1629	Intrav.	1·0 mg.	D. 26 days	Acute G. T.
	1628	Intrav.	0·1 mg.	D. 28 „	Acute G. T.
	1627	Intrav.	less than 0·01 mg.	D 81 „	G. T.
	1632	Intrav.	0·01 mg.	D. 31 „	Acute G. T.
	1630	Subcut.	10·0 mg	D. 197 „	Chronic G. T., slight except in the lungs.
	1631	Subcut.	10·0 mg.	D. 182 „	Slight T.

VIRUS E. IV.—*continued.*

Calf Passage Experiments—*continued.*

PASSAGE γ.

CULTURE.

Derived from the original material through a guinea-pig. Total duration of artificial cultivation, 390 days. Inoculated on January 30, 1907. The culture used was the 18th generation, 21 days old.

CALF 502.

Subcutaneous.

Dose: 50·0 mg.

Killed: April 30, 1907.

90 days.

P.M.—Slight disseminated tuberculosis.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1219	Intrav.	1·0 mg.	D. 14 days	Acute T.
1218	Subcut.	20·0 mg.	D. 35 „	G. T.
1217	Subcut.	10·0 mg.	D. 150 „	Local T., and T. of lungs and kidneys.
1216	Subcut.	1·0 mg.	D. 154 „	Local T., and T. of lungs, kidneys, and thyroid body.

CULTURE.

Derived from the lung.

CALF 614.

Subcutaneous.

Dose: 50·0 mg. of culture of the 4th generation, inoculated on May 7, 1908.

Died: June 9, 1908.

33 days.

P.M.—Death was due to pneumonia, initially non-tuberculous, finally with tuberculosis superadded.

CALF 630.

Subcutaneous.

Dose: 50·0 mg. of culture of the 4th generation, inoculated on May 7, 1908.

Died: June 7, 1908.

31 days.

P.M.—General tuberculosis.

RHESUS MONKEY 222.

Subcutaneous.

Dose: 1·0 mg. of culture of the 5th generation, inoculated on July 23, 1908.

Died: August 25, 1908.

33 days.

P.M.—General tuberculosis.

RABBITS.

—	Number.	Method.	Dose.	Duration of Life.	Result.
July 18, 1907, 4th generation of culture.	1421	Intrav.	1·0 mg.	D. 16 days	Acute G. T.
	1420	Intrav.	0·1 mg.	D. 24 „	Acute G. T.
	1419	Subcut.	10·0 mg.	D. 48 „	G. T. very acute.
	1418	Subcut.	1·0 mg.	D. 78 „	G. T.
May 7, 1908, 4th generation of culture.	1761	Subcut.	50·0 mg.	D. 49 days	G. T.
	1760	Subcut.	10·0 mg.	D. 91 „	G. T.
July 23, 1908, 5th generation of culture.	1841	Intrav.	1·0 mg.	D. 14 days	Acute G. T.
	1842	Intrav.	1·0 mg.	D. 15 „	Acute G. T.

CULTURE.

Derived from the suprarenal body.

CALF 602.

Subcutaneous.

Dose 50·0 mg. of culture of the 5th generation, inoculated on April 7, 1908.

Killed: July 6, 1908.

90 days.

P.M.—General tuberculosis, not severe, but apparently progressive.

RABBITS.

—	Number.	Method.	Dose	Duration of Life.	Result.
January 30, 1908, 3rd generation of culture.	1624	Intrav.	1·0 mg.	D. 23 days	Acute G. T.
	1623	Intrav.	0·1 mg.	K. (dying) 28 days	G. T.
	1622	Intrav.	0·01 mg.	D. 32 days	G. T.
	1626	Subcut.	10·0 mg	D. 163 „	Slight T. cause of death.
	1625	Subcut.	1·0 mg.	K. 217 „	Slight T.
April 7, 1908, 5th generation of culture.	1720	Subcut.	50·0 mg	K. 188 days	Slight T.
	1719	Subcut.	10·0 mg.	K. 188 „	Chronic progressive G. T.

CULTURE.

Derived from the mediastinal gland. The 3rd generation was used for inoculation on August 5, 1908.

RABBITS

inoculated with Emulsion of mediastinal gland.

Number.	Method.	Duration of Life.	Result.
1819	Subcut.	D. 99 days	G. T.
1820	Subcut.	D. 62 „	G. T.
1822	Subcut. and Intrap.	K. 123 „	Slight G. T.

CALF 650.

Subcutaneous.

Dose: 50·0 mg.

Died: September 13, 1908.

39 days.

P.M.—General tuberculosis.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1880	Intrav.	0·1 mg.	D. 17 days	Acute G. T.
1879	Intrav.	0·01 mg.	D. 30 „	Acute G. T.
1881	Subcut.	10·0 mg.	D. 36 „	Acute G. T.
1882	Subcut.	10·0 mg	D. 33 „	Acute G. T.

CALF 604. Virus E. IV.

Subcutaneous inoculation of culture derived from the mesenteric gland of Baboon 74.

Dose—50 milligrammes.

Date of Inoculation—April 28, 1908. [Age 17 weeks.]

Killed when in good general health—July 28, 1908. [91 days after inoculation.]

Clinical History.

There was no disturbance of health.

Temperature.

Temperature normal.

Weights.

	kilos.
April 28, 1908	43·53
July 28, 1908	77·09

Total gain in weight.—33·56 kilos.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a prominent oval tumour measuring 11 by 6·5 by 5 cm. The skin over it was thin at one extremity but was still intact. On section it was a fibrous walled cyst filled with caseo-pus.

Prescapular Glands.—The left prescapular gland measured 6 by 3·5 by 2·5 cm. On section it contained three encapsuled softening caseous gritty nodules replacing the greater part of the gland.

The right prescapular gland measured 4·2 by 2 by 1 cm. On section it was normal.

Liver.—In the liver there were three translucent tubercles, the size of rape seed, with opaque centres.

Mesenteric Glands.—In each of two mesenteric glands there was a single yellow nodule with a softening caseous centre and a translucent capsule.

A third gland contained two similar nodules, the larger about the size of a hemp seed.

There was no tuberculosis elsewhere.

Microscopical examinations of smear preparations made from mesenteric gland showed moderately numerous tubercle bacilli. Liver showed none.

CALF 612. Virus E. IV.

Subcutaneous inoculation of culture derived from the mesenteric gland of Baboon 74.

Dose—50 milligrammes.

Date of Inoculation—April 28, 1908. [Age about 15 weeks.]

Killed when in good general health—July 28, 1908. [91 days after inoculation.]

Clinical History.

There was no disturbance of health.

Temperature.

The temperature remained normal throughout.

Weights.

	kilos.
April 28, 1908	39·90
July 28, 1908	66·66

Total gain in weight.—26·76 kilos.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a prominent rounded tumour measuring 7 by 5 by 5 cm. On section it was a fibrous walled cyst filled with thick caseo pus.

Prescapular Glands.—The left prescapular gland measured 5·2 by 2·5 by 1 cm. and on section it contained at one extremity a few soft caseous tubercles.

The right prescapular gland measured 4·2 by 2·1 by 1·1 cm. On section it was normal.

Lungs.—In the caudal lobe of the left lung there was a small soft caseous nodule, surrounded by a zone of reddish congested tissue.

Bronchial Glands.—In a small bronchial gland on the same side there was a caseous gritty nodule.

Spleen.—In the spleen there were five soft grey translucent miliary nodules, opaque in the centre. There was no tuberculosis of any other organ or gland.

CALF 650. Virus E. IV.

Subcutaneous inoculation with culture derived from the mediastinal gland of Calf 602.

Dose—50 milligrammes.

Date of Inoculation—August 5, 1908. [Age 15 weeks.]

Died—September 13, 1908. [39 days after inoculation.]

Temperature.

The temperature rose gradually until it attained its maximum, 40·3° C., 30 days after inoculation, and then fell slowly until death.

Weights.

	kilos.
August 5, 1908...	66·66
September 13, 1908	52·60

Total loss in weight.—14·06 kilos.

POST-MORTEM EXAMINATION.

Carcass emaciated.

Local Lesion.—At the seat of inoculation there was a firm tumour weighing 1·02 kilos and measuring 20 by 11 by 5·5 cm. It was composed of three layers, the outer one of thickened congested skin infiltrated with yellow caseous tubercles, the middle one of dense pinkish yellow caseating tissue 3 cm. in greatest thickness, and the deep one of fibro-muscular tissue closely studded with caseous nodules.

Prescapular Glands.—The left prescapular gland, much enlarged, weighed a little over 141 grammes. It measured 10 by 6 by 5 cm. The muscle around was adherent to its capsule. On section it was composed throughout of very dense yellow caseated tissue, very slightly gritty from calcification

Prepectoral Glands.—One prepectoral gland on the left side, the size of a walnut, was dense and caseous throughout, two others nearly as large were congested and beset in the cortices with minute greyish tubercles.

Cervical Glands.—On the left side the superior cervical gland was much enlarged, measuring 4 cm. in greatest diameter. On section it was dense, yellow and caseous practically throughout.

Two glands in the middle of the neck on the left side, the size of filberts, were firm, congested, and showed a network of early caseation.

The rest of the cervical glands were congested, slightly enlarged, and contained discrete tubercles.

All the peripheral lymphatic glands showed in the cortices a moderate number of yellow caseous nodules varying from 1 to 2 and sometimes 3 mm. in diameter; the largest were very irregular in outline.

Thorax.

Pleura.—The lymphatic fringes along the margins of the ribs were congested, slightly hypertrophied and contained clusters of miliary tubercles.

On the pleural surface of the diaphragm there were some small patches of vegetations, several of which contained small clusters of miliary tubercles.

Lungs.—The lungs, after the opening of the chest, did not collapse; they were heavy and weighed 3·9 kilos.

The cephalic, right middle and the antero ventral portions of the caudal lobes were dark red, firm, and quite airless. The rest of the caudal lobes were mottled with irregular patches of red hepatisation, the crepitant portions being also firmer than normal and congested. The lung parenchyma was very closely beset with yellow caseous nodules with grey margins ranging, in size from a pin's-head to a hemp seed; they were mostly discrete, but were here and there aggregated into groups.

Thoracic Lymphatic Glands.—The bronchial and mediastinal glands were much enlarged and externally deeply congested; the tissues around them were very oedematous. On section the cortices were composed of firm greyish-yellow caseating tissue. The medullae were soft, red and diffluent.

Abdomen.

Omentum.—The omentum showed on its dorsal surface a moderate number of caseating lenticular nodules, ranging up to 5 mm. in diameter, some deeply congested and loosely attached.

Intestines.—Normal.

Mesenteric Glands.—In several of the mesenteric glands there were caseous patches.

Spleen.—The spleen was much enlarged and weighed 481 grammes, and on section it was very closely beset with firm yellow caseous nodules ranging up to 5 mm. in diameter. The spleen pulp between the nodules was soft and diffluent.

Liver.—The liver was enlarged weighing 2·31 kilos and was paler than normal; it showed evenly distributed throughout its substance moderately numerous yellow caseous nodules, varying from about one to three millimeters in diameter.

Portal Glands.—The portal glands were enlarged, oedematous and congested, and their cortices closely beset with yellow caseous coalescing tubercles.

Kidneys.—The right kidney showed on the surface, as well as in the depth of the cortex, scattered caseating tubercles, the largest the size of a millet seed; there were similar tubercles in the left and a few rather larger.

Suprarenal Bodies.—There were three greyish-white miliary tubercles in the cortex of the right suprarenal body.

The left was normal.

Coeliac Glands.—One coeliac gland was moderately enlarged and showed its cortex largely composed of firm grey tissue, infiltrated with a yellow caseous network and foci. The other glands contained a few discrete tubercles.

The lumbar and renal glands were enlarged and closely beset with yellow caseous nodules.

Tongue.—In the submucous tissue at the base of the tongue there were a few small yellow tubercles.

Tonsils.—Each tonsil contained a few caseous nodules up to 2 mm. in diameter.

The mucous membranes of the pharynx, larynx, and trachea were deeply congested.

RHESUS MONKEY 222. Virus E. IV.

Subcutaneous inoculation with culture derived from the lung of Calf 502.

Dose—1·0 milligramme.

Date of Inoculation—July 23, 1908.

Died—August 25, 1908. [33 days after inoculation.]

POST-MORTEM EXAMINATION.

Local Lesion.—In the subcutaneous tissue of the back, lying chiefly over the right scapular, there was a baggy tumour, over which in three or four places were minute ulcerations in the skin from which soft caseopus was being discharged. On section the walls were lined by shaggy caseous substance.

Axillary Glands.—The axillary glands on both sides were enlarged, caseous and softened.

Cervical Glands.—The lower cervical glands on each side were enlarged, caseous and softened.

Thorax.

Lungs.—The lungs were pale, oedematous and emphysematous; the substance showed sparsely scattered grey points and a few opaque tubercles with grey margins up to a rape seed in size.

Thoracic Lymphatic Glands.—The bronchial glands were enlarged, yellow and caseous.

Several glands at the junction of the ribs with the spine were enlarged, yellow and caseous.

Abdomen.

Intestines.—Normal.

Spleen.—The spleen was slightly enlarged and filled with yellow caseous tubercles from a mere point up to a millet seed in size.

Liver.—The liver was pale and showed numerous greyish opaque tubercles up to a millet seed in size, the majority being that of a rape seed ; the largest could be felt projecting above the surface. On section numerous similar tubercles were seen throughout.

Kidneys.—The kidneys each showed a moderate number of yellowish-grey tubercles with caseous centres up to a rape seed in size.

There were a few flattened slightly opaque nodules in the subcutaneous tissue about the body.

The Inguinal, Iliac and Lumbar Lymphatic Glands showed soft caseous foci.

Tongue, Tonsils, Larynx and Pharynx.—Normal.

CALF 602. Virus E. IV.

Subcutaneous inoculation with culture derived from the suprarenal body of Calf 502.

Dose—50·0 milligrammes.

Date of Inoculation—April 7, 1908. [Age 14 weeks.]

Killed when in good general health—July 6, 1908. [90 days after inoculation.]

Clinical History.

The animal showed no sign of ill-health during the experiment.

Weights.

	kilos.
April 7, 1908	46·71
July 6, 1908	69·83

Gain in weight.—23·12 kilos.

POST-MORTEM EXAMINATION.

General condition good.

Local Lesion.—On the left side of the neck there was a prominent tumour weighing 963 grammes and measuring 17 by 14 by 8 cm. On section it was found to be a cyst with thick fibrous walls beset with irregular caseous gritty areas. It contained in the centre masses of soft caseous substance, some free in a serous fluid and others adherent to the walls.

Prescapular Glands.—The left prescapular gland measured 7·5 by 4 by 4·5 cm. On section it was almost entirely replaced by pinkish caseo-necrotic gritty substance which had broken down to form at one extremity a small caseo-purulent cyst.

The right prescapular gland measured 4 by 2 by 1 cm. On section it was normal.

Prepectoral Glands.—The left round prepectoral gland was more than half replaced by caseous gritty substance.

The left reniform prepectoral gland was normal.

The right prepectoral glands were normal.

Cervical Glands.—The left inferior cervical gland was normal.

A cervical gland at the junction of the upper two-thirds with the lower third of the neck measuring 3·3 by 2·2 by 1·5 cm. resembled on section the prescapular gland.

The left superior cervical gland contained a caseous gritty nodule, replacing more than half the gland substance.

The right superior cervical gland showed a small soft tubercle.

Thorax.

Pleura.—Normal.

Lungs.—On the surface of the left lung beneath the pleura there were visible sparsely scattered grey tubercles with caseous centres up to a millet seed in size, and two congested grey nodules with a central caseous network. On section there were two more similar nodules.

The right anterior lobe was grey, solid, and on section muco-pus welled up from the bronchi.

On the surface of the right posterior lobe there were sparsely-scattered tubercles similar to those in the left (about thirty counted). On section there were several small nodules similar to those on the other side, and a large congested caseous nodule 6 by 2 cm. There was also a congested, caseating nodule the size of a sparrow's egg, and an elongated caseous nodule 6 by 2 cm.

Thoracic Lymphatic Glands.—The caudal mediastinal gland measured 12 by 4 by 3·5 cm. On section it was almost entirely replaced by firm caseous gritty tissue ; the small amount of congested glandular tissue remaining was beset with caseous nodules.

The next mediastinal gland was half replaced by caseous tissue. The rest of the mediastinal glands were congested and beset with caseous nodules.

The left saddle-shaped bronchial gland was moderately enlarged and firm. On section it was congested, and the cortex was closely filled with caseo-calcareous nodules.

The right suprabronchial gland contained a few caseous tubercles.

The right tracheo-bronchial gland showed the cortex closely filled with caseo-calcareous nodules.

The gland within the entrance to the thorax on the left side was enlarged and almost replaced by caseous gritty substance.

Heart.—Normal.

Abdomen.

Omentum.—Normal.

Intestines.—A few of the Peyer's patches contained from one to three soft yellow miliary nodules.

Large Intestine.—Normal.

Mesenteric Glands.—The majority of the mesenteric glands contained from one to three caseo-calcareous tubercles and nodules, which easily shelled out from the gland substance. There were occasionally caseous gritty patches up to 6 and 7 mm. in diameter.

Spleen.—The spleen weighed 266 grammes. On section it contained fairly numerous discrete grey caseating nodules, the majority about 2·5 mm. in diameter.

Liver.—On the convex surface of the liver, just beneath the surface, there was a caseating tubercle the size of a rape seed. In the substance there was a grey nodule 5 mm. in diameter with a caseating centre.

Kidneys.—In the cortex of the left kidney, just beneath the surface there were scattered minute grey foci with whitish centres, some of which continued as streaks into the cortex. In the deeper part there was a grey caseating nodule the size of a wheat grain.

In the right kidney there were a few doubtful grey foci and a single nodule resembling that in the other kidney.

Suprarenal Bodies.—In the right suprarenal body there was a caseating nodule the size of a hemp seed.

The left suprarenal body was normal.

The tonsils contained several collections of soft yellow substance.

Various Lymphatic Glands.

In a Coeliac Gland there was a caseous miliary tubercle.

Both Precrural Glands, the Right Pudic, and the Right Gluteal each showed a similar tubercle.

A Left Iliac Gland contained a caseous gritty tubercle the size of a rape seed.

In three Lumbar Glands there was a moderate number of caseous gritty tubercles up to a hemp seed and a single caseous nodule the size of a pea.

The Left Parotid and Right Submaxillary Glands each contained one, the right pharyngeal three, and the left pharyngeal four, soft caseous tubercles up to a hemp seed in size.

The Right Parotid, Left Submaxillary, Left Gluteal, Ischiatic, and Popliteal Glands were normal.

Microscopical Examinations.

(Smear preparations.)

Bronchus (pus).—No tubercle bacilli.

Liver (nodule).—One tubercle bacillus.

Kidney (tubercle).—No tubercle bacilli.

Tonsil.—No tubercle bacilli.

Caudal Mediastinal Gland (emulsion). — A few tubercle bacilli.

Mediastinal Gland (emulsion). — Blue - stained organisms.

Retro-pharyngeal Gland.—A few tubercle bacilli.

CALF 630. Virus E. IV.

Subcutaneous inoculation with culture derived from the lung of Calf 502.

Dose—50·0 milligrammes.

Date of Inoculation—May 7, 1908. [Age 14 weeks.]

Died—June 7, 1908. [31 days after inoculation.]

Temperature.

The temperature slowly rose until it reached 40·2° Centigrade three days before death.

Weights.

	kilos.
May 7, 1908	35·82
June 7, 1908	29·02

Loss in weight.—6·80 kilos.

POST-MORTEM EXAMINATION.

Carcass emaciated.

Local Lesion.—In the subcutaneous tissue on the left side of the neck there was a tumour measuring 18 cm. in greatest length, 11 cm. in width by 3·5 cm. in thickness. On section it consisted of pinkish caseo-necrotic tissue congested around the margins with a central cavity in process of formation.

Prescapular Glands.—The left prescapular gland measured 9 by 4·5 by 6 cm. On section it was entirely replaced by yellowish firm caseous substance containing foci of congestion.

The right prescapular gland contained irregular caseous tubercles up to a hemp seed in size.

Prepectoral Glands.—The left prepectoral glands were enlarged and oedematous. On section the cortices were firm showing early caseation.

The right prepectoral glands resembled the right prescapular gland.

Cervical Glands.—The left inferior cervical gland, the size of a sparrow's egg, was caseous throughout.

A left superior cervical gland was enlarged and about half replaced by firm caseo-necrotic tissue.

Other cervical glands contained irregular caseous tubercles varying up to a hemp seed in size.

The left axillary gland showed caseous foci at one extremity of the cortex.

Thorax.

Lungs.—The lungs were heavy and did not collapse normally. The anterior lobes and the antero-inferior portions of the posterior lobes were reddish-grey and solid. These solid portions were fairly closely beset with caseating tubercles, collected together in many parts to form caseous patches. The remaining portion of the lungs was congested, contained reddish-grey solid lobules and was closely beset with caseating tubercles varying up to a millet seed. On section of the solid portions muco-pus welled from the bronchi.

Thoracic Lymphatic Glands.—The caudal mediastinal gland measured 9 by 3·3 by 1·8 cm. On section it was congested and the cortex was firm, grey and filled with a yellowish caseous network.

The other mediastinal and bronchial glands resembled the caudal mediastinal gland, showing their cortices firm and more or less replaced by a close, caseous network.

Heart.—Normal.

Abdomen.

Omentum.—In the omentum there were sparsely scattered tubercles up to a millet seed in size.

Intestines.—In the mucous membrane of the small intestine there were a few scattered tubercles and in the Peyer's patches also.

Spleen.—The spleen weighed 226 grammes. On section the cut surface had a granular appearance, the pulp being closely filled with grey caseating tubercles varying up to about a millet seed in size.

Liver.—The liver showed just beneath the surface and in the substance numerous slightly irregular greyish-white tubercles varying up to a millimetre in diameter.

Portal Glands.—The portal glands were firm and contained in the cortices confluent caseating nodules.

Gall Bladder.—Beneath the mucous membrane of the gall bladder there were four caseous tubercles.

Kidneys.—In the cortex of each kidney there were a few scattered minute caseating tubercles.

Suprarenal Bodies.—Normal.

All the lymphatic glands not yet mentioned contained irregular caseous tubercles, the majority small (about a millet seed) and varying up to a hemp seed in size.

CALF 614. Virus E. IV.

Subcutaneous inoculation with culture derived from the lung of Calf 502.

Dose—50·0 milligrammes.

Date of Inoculation—May 7, 1908. [Age 14 weeks.]

Died—June 9, 1908. [33 days after inoculation.]

Temperature.

The temperature fluctuated between 39·2° C. and 39·8° C. during the experiment.

Weights.

	kilos.
May 7, 1908	33·55
June 9, 1908	30·38

Loss of weight.—3·17 kilos.

POST-MORTEM EXAMINATION.

General condition poor.

Local Lesion.—In the subcutaneous tissue on the left side of the neck there was a flat thickening about 6 cm. in diameter, which on section was found to be infiltration of the muscle with small areas of softening caseous substance.

Prescapular Glands.—The left prescapular gland measured 4·8 by 3 by 1·5 cm. On section the cortex was replaced by a pinkish caseo-necrotic network in a grey translucent matrix.

The right prescapular gland measured 3 by 1·2 by 5 cm. On section it was normal.

Prepectoral Glands.—Normal.

Cervical Glands.—A left mid-cervical gland was a little firm and showed the cortex beset with caseous foci.

Other cervical glands were normal.

Axillary Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—The anterior lobes and the antero-inferior portions of the posterior lobes were reddish-grey and airless. On section this solid tissue was found to be beset with purulent nodules. The remaining portions of the lung, that is the dorsal part of the posterior lobes, showed moderately numerous discrete irregular congested nodules up to about 2 mm. On section many of them had minute caseous centres. The tongue-shaped lobe on the left side was firm and on section about half of it was infiltrated with firm yellowish caseous areas.

Thoracic Lymphatic Glands.—The caudal mediastinal gland showed scattered discrete caseous tubercles in the cortex.

The other mediastinal glands were congested and oedematous and showed occasional opaque foci in the cortices.

The saddle-shaped bronchial gland was enlarged, and practically replaced by yellow caseo-necrotic tissue with more opaque gritty streaks.

A right suprabronchial gland showed the cortex firm and beset with caseous tubercles.

Heart.—Normal.

Abdomen.

Intestines.—The majority of the Peyer's patches of the small intestine contained one or two soft yellow caseous nodules varying up to a millet seed in size.

Mesenteric Glands.—Normal.

Spleen.—The spleen weighed 56 grammes and contained three caseating nodules from a millet seed up to a small pea in size.

Liver.—Normal.

Kidneys and Suprarenal Bodies.—Normal.

Other organs and lymphatic glands showed no tuberculosis.

Microscopical Examinations.

(Smear preparations.)

Lung (pus).—Showed moderately numerous small groups of acid-fast granules.

Lung (caseous tissue).—Numerous tubercle bacilli.

CALF 644. Virus E. IV.

Subcutaneous inoculation with culture derived from the prescapular gland of Calf 588.

Dose—50 milligrammes.

Date of Inoculation—May 29, 1908. [Age 12 weeks.]

Killed when in good general health—September 1, 1908. [95 days after inoculation.]

Temperature.

The temperature remained normal throughout the experiment.

Weights.

	kilos.
May 29, 1908	52·15
September 1, 1908	77·54

Total gain in weight.—25·39 kilos.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—At the seat of inoculation in the subcutaneous tissues on the left side of the neck there was a flattened tumour measuring 9 by 7 by 2 cm. On section it consisted of firm yellow caseous gritty tissue beginning to break down in several parts near the centre.

Prescapular Glands.—The left prescapular gland measured 6·3 by 3·3 by 2 cm. On section it was, to a great extent, replaced by caseo-necrotic gritty tissue which affected the central portion, leaving a margin of normal gland tissue just beneath the capsule.

The right prescapular gland measured 5 by 2·2 by 9 cm. On section it was normal.

Thorax.

Lungs.—Normal.

Mediastinal Glands.—The cortices of the mediastinal glands were beset with fairly numerous irregular minute yellowish foci.

Heart.—In the heart-muscle there was a grey translucent miliary nodule.

Abdomen.

Spleen.—In the spleen fairly numerous Malpighian bodies were a little enlarged and contained soft yellow slightly gritty opaque centres.

Suprarenal Bodies.—Each suprarenal body contained a hemp-seed grey caseating nodule.

Portal Glands.—In the portal glands there were a few minute opaque foci.

There was no tuberculosis of any other organ or gland.

Microscopical Examinations.

(Smear preparations.)

Spleen (Malpighian body).—A moderate number of tubercle bacilli.

Heart (nodule).—A few tubercle bacilli.

Mediastinal Gland (focus).—A few tubercle bacilli.

CALF 634. Virus E. IV.

Subcutaneous inoculation with culture derived from the mediastinal gland of Calf 586.

Dose—50 milligrammes.

Date of Inoculation—May 19, 1908. [Age 16 weeks.]

Killed when in good general health—August 31, 1908. [104 days after inoculation.]

Temperature.

The temperature remained normal throughout the experiment.

Weights.

	kilos.
May 19, 1908	45·80
August 31, 1908	86·61

Total gain in weight.—40·81 kilos.

POST-MORTEM EXAMINATION.

General condition good.

Local Lesion.—In the subcutaneous tissue on the left side of the neck there was a sausage-shaped tumour, measuring 16 by 5 cm. On section it was a fibrous-walled cyst filled with yellow caseo-purulent substance.

Prescapular Glands.—The left prescapular gland measured 5·2 by 1·6 by 1 cm. On section it contained at one extremity a small encapsuled soft caseous nodule.

The right prescapular gland measured 5 by 1·7 by 1 cm. On section it was normal.

Prepectoral Glands.—Normal.

Cervical Glands.—The left inferior cervical gland, the size of a sparrow's egg, was about half replaced by soft caseous gritty substance.

In the left superior cervical gland there was a collection of soft caseous gritty nodules up to a hemp seed.

Other cervical glands were normal.

Thorax.

Lungs.—Normal.

Bronchial and Mediastinal Glands.—Normal.

Abdomen.

Omentum.—In the omentum there was a fibrous nodule, 1·3 by 1 cm., with a yellowish necrotic network softening at one point.

Liver. — The liver showed scattered irregular yellowish-grey foci.

Portal Glands.—These glands showed an occasional minute opaque focus.

Kidneys.—The kidneys were fibroid.

All other organs and glands appeared normal.

Microscopical Examinations.

(Smear preparations.)

Liver (foci).—No tubercle bacilli.

Portal Gland (focus).—No tubercle bacilli.

Omental Nodule.—No tubercle bacilli.

CALF 588. Virus E. IV.

Subcutaneous inoculation of culture derived from the bronchial gland of Calf 498.

Dose—50 milligrammes.

Date of Inoculation—February 5, 1908. [Age 9 weeks.]

Killed when in good general health—May 5, 1908. [90 days after inoculation.]

Clinical History.

The animal showed no sign of ill-health.

Temperature.

The temperature remained normal during the experiment.

Weights.

	kilos.
February 5, 1908	71·64
May 5, 1908	68·47

Loss in weight.—3·17 kilos.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—At the seat of inoculation in the subcutaneous tissue on the left side of the neck there was a rounded slightly prominent tumour about 5 cm. in diameter and 2 cm. in thickness. On section the periphery consisted of fibroid tissue and internally there was greyish granulation tissue containing cysts filled with a muco-purulent slightly gritty substance.

Prescapular Glands.—The left prescapular gland measured 4·7 by 2·2 by 1·3 cm. On section about half the gland contained pinkish fibroid nodules beset with caseous gritty foci aggregated into collections, two of which were soft and caseo-purulent.

The right prescapular gland measured 4·2 by 1·8 by ·8 cm. On section it was normal.

There was no sign of tuberculosis elsewhere.

Microscopical examinations of smear preparations of the local lesion and prescapular gland showed numerous tubercle bacilli.

CALF 586. Virus E. IV.

Subcutaneous inoculation of culture derived from the lung of Calf 498.

Dose—50 milligrammes.

Date of Inoculation—February 5, 1908. [Age 9 weeks.]

Died—March 12, 1908. [36 days after inoculation.]

Clinical History.

The animal suffered from diarrhœa before the inoculation and showed signs of a slowly progressing broncho-pneumonia.

Temperature.

The temperature began to rise on the 18th day and reached 40° C. on the 21st; it fell for a few days and again rose to 40·1° C.; after which it fell to 39° C., about which point it remained until death.

Weights.

	kilos.
February 5, 1908	58·95
March 12, 1908...	53·51

Total loss in weight.—5·44 kilos.

POST-MORTEM EXAMINATION.

General condition poor.

Local Lesion.—At the seat of inoculation in the subcutaneous tissue on the left side of the neck there was a flattened pear-shaped tumour measuring 11 by 5 by 2 cm. On section it was partly composed of congested fibrous translucent tissue, containing a yellow caseous centre which was becoming caseo-purulent. At the narrow end there was a cord with a softening caseous centre.

Prescapular Glands.—The left prescapular gland measured 6 by 3·5 by 1·5 cm. On section it was deeply congested and oedematous; almost half of its substance was firm and showed four nodules, one uniformly caseous, the others diffusely caseous.

The right prescapular gland measured 4 by 2·2 by 1·0 cm. On section it was congested.

Prepectoral Glands.—The prepectoral glands were congested and oedematous.

Cervical Glands.—A left superior cervical gland was firm and diffusely caseous throughout.

A left middle cervical gland showed its cortex beset with caseous foci.

The other cervical glands were congested and oedematous.

Axillary Glands.—Normal.

Thorax.

Lungs.—The anterior, middle and almost half of the right posterior lobes and more than half of the left posterior lobes were dark red, solid and airless. The solid substance was beset with purulent foci and pus could be squeezed from the cut surfaces.

Mediastinal Glands.—The caudal mediastinal gland measured 10·5 by 3·5 by 1·1 cm.

On section it was congested, slightly oedematous and firm, but showed no caseation.

Other mediastinal and the bronchial glands were similar.

Abdomen.

Mesenteric Glands.—Several of the mesenteric glands were a little firm, but there was no sign of caseation.

Spleen.—Normal.

Liver.—Normal.

Portal Glands.—These glands were a little oedematous.

Kidneys.—Each kidney showed in the cortex a few grey translucent wedge-shaped patches, extending to the pyramids and beset superficially with irregular opaque yellow foci. The pelvis were oedematous and both ureters were thickened.

Suprarenal Bodies.—In the cortices of the suprarenal bodies there were scattered discrete minute grey foci.

One lumbar gland contained two grey foci.

There was no tuberculosis elsewhere.

Microscopical Examinations.

(Smear preparations.)

Lung (congested patch).—No tubercle bacilli.

Lung (pus).—No tubercle bacilli.

Spleen (substance).—No tubercle bacilli.

Liver (substance).—No tubercle bacilli.

Mediastinal Gland.—No tubercle bacilli.

Intestine (scraping).—No tubercle bacilli.

Mesenteric Gland.—A moderate number of tubercle bacilli.

Suprarenal Body (focus).—A few tubercle bacilli.

Bronchial Gland.—A few tubercle bacilli.

Lumbar Gland (focus).—A few tubercle bacilli.

CALF 642. Virus E. IV.

Subcutaneous inoculation with culture derived from the suprarenal body of Calf 584.

Dose—50 milligrammes.

Date of Inoculation—May 29, 1908. [Age 12 weeks.]

Killed when in good general health—September 2, 1908. [96 days after inoculation.]

Temperature.

The temperature rose to 39·9° C. on the 13th day, and then fluctuated between 39·7° and 39·1° C. until the 38th day; it then fell and remained normal until death.

Weights.

	kilos.
May 29, 1908	49·42
September 2, 1908	100·67

Total gain in weight.—51·15 kilos.

POST-MORTEM EXAMINATION.

General condition good.

Local Lesion.—In the subcutaneous tissues on the left side of the neck there was a slightly prominent rounded tumour measuring 6 by 4 cm. On section it consisted of thick fibrous walls, lined internally by a layer of granulation tissue and filled with a clear fluid and curdy caseous masses.

Prescapular Glands.—The left prescapular gland measured 5·7 by 3 by 2·3 cm. On section about half the gland was replaced by yellow caseous gritty collections of tubercles.

The right prescapular gland measured 4·7 by 2 by 1 cm. On section it was normal.

Thorax.

Lungs.—Normal.

Mediastinal Glands.—In the cortex of the caudal mediastinal gland there were a few scattered minute opaque yellow foci.

Abdomen.

Mesenteric Glands.—In a few of the mesenteric glands there were opaque foci varying up to a rape seed in size, the largest being gritty.

Spleen.—In the spleen about 20 Malpighian bodies were slightly enlarged and were opaque and yellow in the centre; this yellow centre consisted of soft caseous substance, usually gritty.

Suprarenal Bodies.—Each suprarenal body contained two caseous nodules up to nearly a hemp seed in size.

All other organs and glands appeared normal.

CALF 636. Virus E. IV.

Subcutaneous inoculation with culture derived from the spleen of Calf 582.

Dose—50 milligrammes.

Date of Inoculation—May 25, 1908. [Age 20½ weeks.]

Killed when in good general health—August 31, 1908. [98 days after inoculation.]

Temperature.

The temperature rose to 40° C. on the 23rd day and reached 40·4 on the 26th day. It remained about that point for four days, after which it slowly fell and remained normal from the 43rd day until the animal was killed.

Weights.

	kilos.
May 25, 1908	58·49
August 31, 1908	95·68

Total gain in weight.—37·19 kilos.

POST-MORTEM EXAMINATION.

General condition good.

Local Lesion.—In the subcutaneous tissue on the left side of the neck there was a prominent oval tumour measuring 10 by 7 by 6 cm. On section it was a fibrous walled cyst filled with yellow caseo-pus.

Prescapular Glands.—The left prescapular gland measured about 8 by 6 by 3 cm. On section it was almost entirely replaced by three nodules composed of breaking down yellow caseo-necrotic substance.

The right prescapular gland measured 4·6 by 2·1 by 1 cm. On section it contained a single caseous miliary tubercle.

Prepectoral Glands.—Normal.

Cervical Glands.—Two left inferior cervical glands, the largest the size of a pigeon's egg, were practically replaced by caseo-necrotic gritty substance.

A right inferior cervical gland contained one caseous nodule the size of a hemp seed.

Thorax.

Lungs.—Normal.

Thoracic Lymphatic Glands.—The dorsal mediastinal glands contained a moderate number of tubercles and nodules, varying mainly up to a hemp seed; one or two attained the size of small peas. They were composed of yellow caseous tissue, with slight grey margins; the majority easily shelled out.

The bronchial glands resembled the mediastinal glands.

Abdomen.

Ileo-Colic Glands.—One ileo-colic gland contained fairly numerous minute opaque foci and caseous gritty tubercles up to a millet seed which easily shelled out of the gland substance.

Mesenteric Glands.—In some of the mesenteric glands an occasional similar tubercle was seen.

Spleen.—Several Malpighian bodies showed very slight opacity in the centres.

Kidneys.—In the left kidney there were two grey tubercles with opaque centres.

Portal Glands.—These glands resembled the mesenteric glands.

Lumbar Glands.—Two lumbar glands contained softening caseous tubercles and opaque foci.

Iliac Glands.—In an iliac gland there were two caseous miliary tubercles with grey margins easily shelling out.

All other organs and glands appeared normal.

Microscopical Examinations.

(Smear preparations.)

Spleen (opaque Malpighian body).—No tubercle bacilli.

Kidney (tubercle).—No tubercle bacilli.

Mediastinal Gland.—A very few tubercle bacilli.

CALF 584. Virus E. IV.

Subcutaneous inoculation of culture derived from the prescapular gland of Calf 408.

Dose—50 milligrammes.

Date of Inoculation—January 30, 1908. [Age 8 weeks.]

Killed when in good general health—May 7, 1908. [98 days after inoculation.]

Clinical History.

About 40 days after the inoculation, the animal became so weak on the hind legs as to be unable to rise. After a few weeks it quite regained the use of them. Its general health remained good.

Temperature.

The temperature remained normal during the experiment.

Weights.

	kilos.
January 30, 1908	55·32
May 7, 1908	69·83

Total gain in weight.—14·51 kilos.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—At the seat of inoculation in the subcutaneous tissue on the left side of the neck there was a prominent tumour measuring 12 by 9 by 5·5 cm. On section it was found to be a cyst, with grey fibrous walls crossed by trabeculae, and filled with curdy caseous substance and yellowish turbid fluid.

Prescapular Glands.—The left prescapular gland measured 6·5 by 4 by 3 cm. On section it was largely replaced by softening caseo-necrotic substance so as to be partly cystic.

The right prescapular gland measured 4·3 by 1·8 by ·8 cm. On section it was normal.

Thorax.

Lungs.—The lungs were normal except for minute haemorrhagic foci.

Mediastinal Glands.—In the cortices of the mediastinal glands there were just visible scattered minute grey foci.

Bronchial Glands.—There was an occasional focus in the bronchial glands.

Abdomen.

Liver.—The liver showed in the substance scattered minute translucent foci.

Kidneys.—In the cortices of the kidneys just beneath the capsule there were a few translucent foci.

Suprarenal Bodies.—In the cortices of the suprarenal bodies there was a moderate number of grey caseating tubercles, the majority about the size of millet seed.

Other organs and glands were normal.

Microscopical Examinations.

(Smear preparations.)

Prescapular Gland.—Moderately numerous tubercle bacilli.

Mediastinal Gland (foci).—No tubercle bacilli.

Bronchial Gland (foci).—No tubercle bacilli.

Liver (foci).—No tubercle bacilli.

Kidney (focus).—No tubercle bacilli.

Suprarenal Body (tubercle).—Moderately numerous tubercle bacilli.

CALF 582. Virus E. IV.

Subcutaneous inoculation of culture derived from the prescapular gland of Calf 408.

Dose—50 milligrammes.

Date of Inoculation—January 30, 1908. [Age 8 weeks.]

Killed—April 27, 1908. [88 days after inoculation.]

Clinical History.

The general condition was poor. The animal had suffered before inoculation from diarrhœa which lasted almost throughout the course of the experiment.

Temperature.

The temperature remained normal during the experiment.

Weights.

	kilos.
January 30, 1908	48·62
April 27, 1908	47·71

Loss of weight.—·91 kilo.

POST-MORTEM EXAMINATION.

General condition was poor.

Local Lesion.—At the seat of inoculation in the subcutaneous tissue on the left side of the neck there was an area of thickening measuring 8 by 6 by 1 cm. On section this was found to be a layer of fibrous tissue beset with close yellow caseous network about 5 mm. in thickness, adherent to the skin and underlying muscle.

Prescapular Glands.—The left prescapular gland measured 6·2 by 3·5 by 2·2 cm. On section about two-thirds were composed of firm yellowish caseo-necrotic tissue with a few opaque gritty streaks. The rest of the gland was firmer than normal but quite grey and translucent.

The right prescapular gland measured 5·5 by 2·6 by 1·3 cm. Part of the cortex on section was a little firm but otherwise normal.

Prepectoral Glands.—Normal.

Cervical Glands.—A small left inferior cervical gland contained a patch of caseo-calcareous tissue in the cortex.

Other cervical glands were normal.

Axillary Glands.—Normal.

Thorax.

Lungs.—The lungs collapsed fairly well; they were a little oedematous. A considerable part of both anterior lobes was reddish-grey and solid but apparently in process of resolution, except for one part where there was a purulent nodule the size of a sparrow's egg; there were a few small collapsed lobules in the rest of the lung. In the parenchyma, just beneath the pleura, there was a moderate number of discrete grey tubercles with opaque centres varying up to 1 mm. in diameter; on section through the tubercles the opaque centre was, in the majority of cases, caseous and gritty. On section through the lung the tubercles were evenly distributed throughout the substance.

Thoracic Lymphatic Glands.—The caudal mediastinal gland measured 5 by 1·7 cm. On section the cortex, which was a little firm, was beset with minute irregular grey necrotic foci.

The left bronchial gland was a little firm and on section the cortex was translucent and showed in parts a fine caseous network and small patches of caseous tissue.

Other bronchial and mediastinal glands showed occasional grey foci.

Abdomen.

Intestines. — In the Peyer's patches of the small intestine there were, in all, six soft yellow caseous tubercles the size of rape seed beneath the mucous membrane.

Large Intestine.—Normal.

Mesenteric Glands.—The mesenteric glands were perhaps a little enlarged but there was no sign of caseation.

Spleen.—The spleen weighed 113 grammes. On section the substance was found to be beset with moderately numerous nodules varying from a rape seed up to a millet seed; they consisted of soft grey translucent tissue with a soft caseating centre in which no grittiness could be detected.

Liver.—On the surface of the liver beneath the capsule could be seen a moderate number of discrete minute greyish tubercles, the largest measuring 0·5 mm.; they were most numerous on the convex surface and in an area 3 cm. square nine were counted. On section through the substance they were found distributed in similar proportions throughout. They were easily picked out, were translucent, and cracked like egg shells when crushed.

Portal Glands.—In the cortex of a portal gland a few minute greyish-white foci were seen.

Kidneys.—On the surface of the kidneys a few minute congested foci were seen but no tubercles.

There was no sign of tuberculosis in any other organ or gland.

Microscopical Examinations.

(Smear preparations.)

Prescapular Gland (emulsion).—Numerous tubercle bacilli.

Lung, Nodule (pus).—No tubercle bacilli.

Right Prescapular Gland.—No tubercle bacilli.

Liver (several glassy tubercles). — No tubercle bacilli.

Spleen (emulsion).—A moderate number of tubercle bacilli.

Bronchial Gland (*I.*).—No tubercle bacilli.

Bronchial Gland (*II.*).—No tubercle bacilli (Diplococci).

Mesenteric Gland.—No tubercle bacilli.

Intestine (tubercle).—No tubercle bacilli.

Intestine (scraping of Peyer's patch).—No tubercle bacilli.

RHESUS MONKEY 220. Virus E. IV.

Subcutaneous inoculation with culture from the prescapular gland of Calf 408.

Dose—1·0 milligramme.

Date of Inoculation—July 23, 1908.

Killed when in good general health—October 27, 1908. [96 days after inoculation.]

Clinical History.

The animal had shown no sign of ill-health since inoculation beyond being at one time a little quiet.

POST-MORTEM EXAMINATION.

The carcass was in good condition with a fair amount of subcutaneous fat.

Local Lesion.—In the skin of the back at the seat of inoculation, there was an area roughly 5 cm. in diameter, covered with dried scabs; beneath these were several ulcers irregular in outline and separated from each other by bridges of undermined skin. Beneath, in the subcutaneous tissue, was a tumour 1 cm. in thickness composed of fibrous tissue in contact with the muscle, and a layer of softening caseo-necrotic substance forming the base of the ulcers.

At the dorsal margin of the left sterno-mastoid there was a gland the size of a sparrow's egg, caseous and softened throughout. At the anterior margin in the same group of glands there were two containing soft caseous nodules.

On the right side the corresponding gland, dorsal to the sternal end of sterno-mastoid, 1 cm. in diameter, was partly caseous and softened. A single anterior gland the size of a pea was caseous throughout.

Axillary Glands.—One right axillary gland the size of a pea was caseous and softened.

Two glands on the left side, the largest 1 cm. in diameter, were partly soft, yellow, and caseous.

The submaxillary, inguinal, and other cervical glands were normal.

Thorax.

Lungs.—The lungs collapsed well, they showed a moderate number of translucent tubercles varying from a point up to 2 mm. in diameter; the largest showed opaque caseous centres.

Bronchial Glands.—Normal.

Manubrial and Vertebral Glands.—Normal.

Abdomen.

Intestines.—Normal.

Spleen.—The spleen was irregular in outline from the presence of numerous caseo-purulent nodules, at one part confluent and forming a nodule 7 mm. in diameter.

Liver.—The liver was pale but showed no definite tubercles.

Kidneys.—Each kidney showed in the cortex a moderate number of tubercles varying up to a millet seed in size. The majority were translucent, the largest soft, yellow, and caseous in the centre.

Suprarenal Bodies.—Normal.

Lumbar and Iliac Glands.—Normal.

Testes.—Normal.

Brain.—Normal.

CONTROL EXPERIMENTS WITH BOVINE TUBERCLE BACILLI ON HORSES AND MONKEYS.

SUMMARY OF RESULTS OF INOCULATION EXPERIMENTS ON HORSES WITH BOVINE TUBERCLE BACILLI.

One pony, No. 30, was inoculated intravenously with 10 milligrammes of culture of Virus B. XI. and died 20 days after inoculation. At the post-mortem examination the lungs were firm, congested, and oedematous and the substance was closely beset with minute translucent tubercles. An occasional focus was seen in the kidneys but there were no tuberculous lesions elsewhere. Smear preparations showed a moderate number of tubercle bacilli in the organs.

Pony 6, aged, was inoculated subcutaneously with 50 milligrammes of culture of Virus B. XII., and was killed in good health 132 days later. The post-mortem examination showed a small local lesion and caseation of three of the neighbouring prescapular glands without other sign of tuberculosis.

Pony 12, yearling, was inoculated subcutaneously with 50 milligrammes of culture of Virus B. XI. and was killed 124 days later. It was in good health and had gained in weight. The local lesion consisted of scar tissue beset with caseo-calcareous nodules, and numerous glands in the prescapular group were caseous. There were numerous hard translucent tubercles in the lungs and a moderate number of gritty tubercles in the liver and spleen; in none of these organs could tubercle bacilli be found by the microscopical examination of smear preparations. Various lymphatic glands contained a few tubercles. In this case there were signs of extensive dissemination but the disease was apparently retrogressive.

A culture was recovered from the prescapular gland of the horse, and was tested in a calf and in rabbits. The results showed that the virus had not been altered in virulence for these animals by residence in the horse.

Two ponies were fed with culture administered in their drinking water.

Pony 26, a yearling, received 100 milligrammes of culture of Virus B. XI. and was killed in good health 166 days later. There was a caseo-calcareous granule in a submaxillary gland and caseous gritty tubercles in the cervical, mesenteric, and colic glands. The liver contained two nodules of doubtful origin and the lungs one. There was no other disease.

Pony 8, aged, received 100 milligrammes and was killed in good health 132 days later. At the post-mortem examination one superior cervical gland was partly caseous and there was a caseous nodule in each of two mesenteric glands (T.B.). The lungs, liver and spleen contained hard nodules probably parasitic in origin.

From these results it is seen that the intravenous inoculation of bovine tubercle bacilli has caused fatal general tuberculosis in a horse but that progressive tuberculosis has not been produced by subcutaneous inoculation and feeding with large doses of culture of bovine tubercle bacilli.

CONTROL EXPERIMENTS ON MONKEYS WITH BOVINE TUBERCLE BACILLI.

It will be of interest to contrast the duration of life of monkeys infected with equivalent doses of bovine and equine cultures (Virus E. II. and E. IV.) respectively.

Monkey 214 was fed with 50 milligrammes of culture of Virus B. XI. in milk and died of general tuberculosis in 32 days.

Monkeys 202, 208, 210 and 212 fed with equivalent doses of culture of Viruses E. II. and E. IV. were killed or died after 101, 115, 77 and 82 days respectively.

Monkey 206 which was fed with 50 milligrammes of the culture from Calf 506 (increased in virulence for the calf) was killed dying after 48 days.

Monkey 224 died of general tuberculosis in 29 days after the subcutaneous inoculation of 1 milligramme of culture of Virus B. XI. The monkeys inoculated with a like dose of culture of Viruses E. II. and E. IV. were Nos. 180 and 178 which died after 101 and 89 days respectively, and Nos. 220 and 218 which were killed after 96 and 95 days respectively.

A monkey, No. 222, which received 1 milligramme of culture of Calf 502, Virus E. IV. (culture increased in virulence for the calf) died of general tuberculosis in 33 days.

EXPERIMENTS ON HORSES WITH BOVINE TUBERCLE BACILLI.

VIRUS B. XI.

CULTURE INOCULATIONS.

(1.)

I.—January 24, 1908.

The strain was derived from the original material and had been 1,291 days in artificial cultivation.
The culture used was the 31st generation, 21 days old.

PONY 12.
Subcutaneous.
Dose : 50·0 mg.
Killed : May 27, 1908.
124 days.
P.M.—Local tuberculosis and disseminated tuberculosis, apparently retrogressive.

RABBITS.

Number.	Dose.	Method.	Duration of Life.	Result.
1604	10·0 mg.	Subcut.	D. 40 days	G. T.
1605	10·0 mg.	Subcut.	D. 78 „	G. T.

Culture from the prescapular gland.

Inoculated on August 5, 1908.
The culture used had been 70 days in artificial cultivation and was the 4th generation, 9 days old.

CALF 652.
Subcutaneous.
Dose : 50·0 mg.
Died : September 18, 1908.
44 days.
P.M.—General tuberculosis.

RABBITS.

Number.	Dose.	Method.	Duration of Life.	Result.
1884	0·1 mg.	Intrav.	D. 20 days	G. T.
1883	0·01 mg.	Intrav.	D. 25 „	G. T.
1885	10·0 mg.	Subcut.	D. 35 „	G. T.
1886	10·0 mg.	Subcut.	K. (ill) 28 days.	G. T.

(2.)

II.—March 20, 1908.

The strain was derived from the original material and had been 1,347 days in artificial cultivation
The culture used was the 36th generation, 20 days old.

PONY 26.
Fed.
Dose : 100·0 mg.
Killed : September 3, 1908.
166 days.
P.M.—Tuberculosis (slight) of a submaxillary, cervical, mesenteric, and colic glands. Two nodules in the liver and one in the lung of a doubtful nature.

PONY 30.
Intravenous.
Dose : 10·0 mg.
Died : April 9, 1908.
20 days.
P.M.—Acute tuberculosis.

VIRUS B. XII.

CULTURE INOCULATIONS.

SEPTEMBER 6, 1907.

The strain was derived from the original material and had been 1,135 days in artificial cultivation.
The culture used was the 38th generation, 20 days old.

PONY 6.

Subcutaneous.
Dose : 50·0 mg.
Killed : January 16, 1908.
132 days.

P.M. — Local tuberculosis. Two doubtful nodules in the liver and a few foci in a bronchial gland. (No T.B.) No disease elsewhere.

CULTURE.

Prescapular Gland.

RABBITS.

Inoculated on April 11, 1908.

The culture used was the 4th generation, 21 days old, and had been 85 days in artificial cultivation.

Number.	Dose.	Method.	Duration of Life.	Result.
1737	1·0 mg.	Intrav.	D. 14 days	G. T.
1735	0·1 mg.	Intrav.	D. 16 ,,	G. T.
1736	0·01 mg.	Intrav.	D. 27 ,,	G. T.
1734	10·0 mg.	Subcut.	D. 62 ,,	G. T.

RABBITS.

Number.	Dose.	Method.	Duration of Life.	Result.
1435	1·0 mg.	Intrav.	D. 18 days	G. T.
1434	0·1 mg.	Intrav.	D. 26 ,,	G. T.
1436	10·0 mg.	Subcut.	D. 81 ,,	G. T.

Culture from the original material.

RABBITS.

Inoculated on April 11, 1908.

The culture used was the 42nd generation, 21 days old, and had been 1,353 days in artificial cultivation.

Number.	Dose.	Method.	Duration of Life.	Result.
1730	1·0 mg.	Intrav.	D. 10 days	Early G. T.
1732	0·01 mg.	Intrav.	D. 22 ,,	G. T.
1731	10·0 mg.	Subcut.	D. 48 ,,	G. T.

PONY 8.

Fed.
Dose : 100 mg.
Killed : January 16, 1908.
132 days.

P.M.—Slight tuberculosis of a cervical and a mesenteric gland. Doubtful nodule in the spleen. No tuberculosis elsewhere.

CONTROL EXPERIMENTS ON MONKEYS WITH BOVINE TUBERCLE BACILLI.

VIRUS B. XI.

CULTURE INOCULATIONS.

APRIL 17, 1908.

The strain was derived from Rabbit 1587 (inoculated with culture from the original material) and had been in artificial cultivation a total period of 65 days.

The culture used was the 3rd generation, 21 days old.

MONKEY 214.

Fed.

Dose : 50·0 mg.

(10·0 mg. per day with milk.)

Died : May 19, 1908.

32 days (after the first feeding).

P.M.—General tuberculosis. Intestinal and mesenteric gland disease severe.

RABBITS.

Number.	Dose.	Method.	Duration of Life.	Result.
1743	0·1 mg.	Intrav.	D. 18 days	G. T.
1741	0·000·0001 mg.	Intrav.	D. 74 „	G. T.

JULY 23, 1908.

The strain was derived from the original material.

The culture used was the 41st generation, 13 days old, and had been in cultivation a total period of 1,473 days.

MONKEY 224.

Subcutaneous.

Dose : 1·0 mg.

Died : August 21, 1908.

29 days.

P.M.—General tuberculosis.

RABBITS.

Number.	Dose.	Method.	Duration of Life.	Result.
1847	1·0 mg.	Intrav.	D. 15 days	G. T.
1848	1·0 mg.	Intrav.	D. 14 „	G. T.

PONY 12. [Yearling.] Virus B. XI.

Subcutaneous inoculation of culture derived from the original material.

Dose—50 milligrammes.

Date of Inoculation—January 24, 1908.

Killed when in good general health—May 27, 1908. [124 days after inoculation.]

Clinical History.

An ulcer formed, from which there was a purulent discharge, 7 days after inoculation. On February 11, 18 days after inoculation, there was an indurated area 12·5 cm. in greatest diameter, ill-defined and highest near the ulcer. Later the breathing was quiet but a little jerky.

Temperature.

The temperature was slightly raised during the five weeks following the inoculation, reaching 40·4° C. on the 36th day; it then quickly fell and remained normal until death.

Weights.

	kilos.
January 24, 1908	87·07
March 16, 1908	87·98
May 27, 1908	99·31

Total gain in weight.—12·24 kilos.

Tuberculin Test.

May 13, 1908 [109 days after the experiment began]. Dose of tuberculin, 3·0 cc. (bovine). Rise of temperature, 2·5° Centigrade.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—The skin at the seat of inoculation on the left side of neck was thickened by cicatricial tissue and showed three small holes about 2 mm. across. In the subcutaneous tissues there was an area about 6 cm. in diameter and about 1 cm. in thickness, composed of firm white scar tissue beset with small caseo-calcareous nodules. The scar tissue was adherent to the muscle, which contained moderately numerous grey tubercles with opaque gritty centres up to a millet seed in size.

Prescapular Glands.—Along the anterior margin of the left scapula there was a chain composed of numerous glands, the largest about the size of a thrush's egg. Several were completely replaced by softening caseous gritty substance, others were uniformly enlarged and contained a few caseous tubercles and nodules.

In a line with these there was a mass just anterior to the first rib measuring 6 by 4 by 2·5 cm.

On section this was composed of discrete caseo-calcareous nodules set in a matrix of fibrous tissue.

Posterior to the latter, just within the thorax beneath the first rib, there was a group of glands, of which some were entirely replaced by yellowish caseo-necrotic tissue with more opaque gritty streaks and others contained caseous gritty nodules.

In one right prescapular gland there was a small collection of caseous tubercles; the others were normal.

A gland on the left side of the lower third of the neck, the size of a robin's egg, was caseous throughout.

Thorax.

Lungs.—The lungs were crepitant. Numerous hard tubercles could be felt beneath the surface especially in the margins, and on close examination could also be seen beneath the pleura; a few projected slightly. They varied up to about 2 mm. in diameter, but the majority were submiliary. On section through them they were composed wholly of firm translucent tissue, some few had minute opaque centres. On section through the parenchyma numerous similar tubercles were distributed throughout, but the majority, being quite transparent, were difficult to see.

Mediastinal Glands.—In the dorsal mediastinal glands, which were not obviously enlarged, there was an occasional grey tubercle with an opaque centre.

Bronchial Glands.—In the bronchial glands, which were not obviously enlarged, there were a few similar tubercles and an occasional softening yellow caseous nodule.

Abdomen

Spleen.—The spleen weighed 283 grammes. It showed, both on and in the capsule, numerous firm fibroid tubercles varying up to nearly 2 mm. in diameter; the majority were small and grey, the largest were greyish-white. On section through the substance there were sparsely scattered grey translucent tubercles with slight central opacities up to a hemp seed in size, the largest of which were calcareous in the centre.

Liver.—On the surface of the liver, just beneath the capsule, there were numerous discrete tubercles varying from a point up to 2 mm. in diameter, a few of which projected; the smallest were quite translucent, the largest were a little opalescent and opaque yellow in the centre. On section through the substance of the liver the tubercles were less numerous and smaller than on the surface.

Portal Glands.—The portal glands contained moderately numerous firm grey tubercles with opaque centres ranging up to a millet seed in size.

Kidneys.—In the cortex of the right kidney there were three grey rather ill-defined translucent tubercles, with slightly gritty opaque centres, up to a millet seed in size. In the left kidney there were a few scattered similar tubercles.

Lumbar Glands.—The lumbar glands contained discrete nodules up to a hemp seed in size, some of which were translucent and not sharply defined, others were grey with yellow caseous or gritty centres.

Iliac Glands.—In the iliac glands there were a few minute caseating tubercles.

Testes.—Normal.

The right epididymis was swollen and contained two cystic nodules filled with yellow pus, the largest 5 mm. in diameter.

There was no tuberculosis of any other organ or gland in the body.

Microscopical Examinations.

(Smear preparations.)

Emulsion of Prescapular Gland.—Numerous tubercle bacilli.

Epididymis (nodule).—A few tubercle bacilli.

Kidney.—No tubercle bacilli. A few blue staining bacilli seen.

Lung (tubercle) }
Liver „ } No tubercle bacilli.
Spleen „ }

NOTE.—Extensive dissemination but apparently retrogressive. The liver and lung tubercles were fibrous; those in the spleen were gritty.

CALF 652. Virus B. XI.

Subcutaneous inoculation with culture derived from the prescapular gland of Pony 12.

Dose—50 milligrammes.

Date of Inoculation—August 5, 1908. [Age 12 weeks.]

Died—September 18, 1908. [44 days after inoculation.]

Temperature.

The temperature rose gradually, attaining 39·9° C. 17 days after inoculation; it remained with slight fluctuations about this level, but never rising higher, until death.

Weights.

	kilos.
August 5, 1908	59·85
September 18, 1908	49·42

Total loss in weight.—10·43 kilos.

POST-MORTEM EXAMINATION.

Carcass emaciated.

Local Lesion.—At the seat of inoculation in the subcutaneous tissue on the left side of the neck there was a prominent tumour measuring 18 by 12 by 6 cm., and weighing with skin and muscle 963 grammes. On section it consisted of congested caseo-necrotic tissue. It included at one extremity the left prescapular gland, which measured 9 by 6 by 6 cm., and consisted of caseous tissue throughout. The right prescapular gland contained discrete caseous nodules up to a pea in size, confluent in parts and forming caseous patches.

Prevectoral Glands.—A left prepectoral gland showed caseous patches in the cortex. A second gland showed discrete grey foci.

Cervical Glands.—The left inferior cervical glands were enlarged and showed discrete grey foci set in firm translucent tissue. A middle cervical gland was half caseous.

The right inferior, middle, and superior cervical glands contained a varying number of caseous nodules.

Axillary Glands.—The left axillary gland contained two or three caseating nodules and numerous grey foci.

The right axillary showed a few caseous nodules up to 5 mm. in diameter.

Thorax.

Pleura.—The lymphatic fringes along the ribs contained numerous small flattened translucent tubercles.

Lungs.—The lungs were heavy and did not collapse normally, they sank completely in water. On section the lung parenchyma was dark red, especially on one side, and was closely filled with irregular caseous nodules.

Mediastinal Glands.—The caudal mediastinal gland measured 15 by 6 by 3·7 cm. On section the cortex was composed of firm reddish-grey tissue with a close yellow caseous network.

The other mediastinal and the bronchial glands were enlarged and resembled the caudal gland.

Abdomen.

Intestines.—The small intestines were congested and the Peyer's patches showed an occasional caseous nodule.

Mesenteric Glands.—The mesenteric glands were a little enlarged and were firm; a considerable part of the cortices was replaced by caseous nodules and areas.

Spleen.—The spleen weighed 283 grammes. On section it was fairly closely filled with caseating nodules up to a pea in size.

Liver.—In the liver there were numerous grey nodules with opaque centres, varying much in size, from less than a rape seed up to a pea.

Portal Glands.—These glands were enlarged; the cortices were firm and closely filled with confluent grey caseating nodules.

Kidneys.—In the cortices of the kidneys there were sparsely scattered grey nodules, caseating in the centre, up to about a hemp seed in size.

Suprarenal Bodies.—Each suprarenal body contained two caseating tubercles.

The lumbar and iliac glands contained discrete caseous nodules up to a hemp seed in size.

Tongue, Larynx and Pharynx.—Normal.

Tonsils.—The tonsils showed several caseous nodules.

Trachea.—Along the trachea there were a few flattened congested nodules.

The posterior pharyngeal, submaxillary, precrural, popliteal and gluteal glands contained varying numbers of discrete caseous nodules up to a pea in size.

PONY 26. [Yearling.] Virus B. XI.

Fed once with culture derived from the original material. [Given in its drinking water.]

Dose—100·0 milligrammes.

Date of Feeding—March 21, 1908.

Killed when in good general health—September 3, 1908. [166 days after the experiment began.]

Clinical History.

There was no sign of ill-health during the experiment.

Temperature.

Normal.

Weights.

	kilos.
March 20, 1908	66·66
September 3, 1908	155·51

Total gain in weight.—88·85 kilos.

Tuberculin Test.

May 13, 1908. [53 days after the experiment began.] Dose of tuberculin, 3·0 cc. Rise of temperature, 1·6° C.

POST-MORTEM EXAMINATION.

General condition good.

Submaxillary Glands.—In one submaxillary gland there was a yellow caseo-calcareous granule.

Cervical Glands.—Two or three superior cervical glands on each side contained an occasional bright yellow small caseo-calcareous patch or streak.

Abdomen.

Mesenteric Glands.—Almost all the mesenteric glands contained from one to six bright yellow, irregular, caseo-calcareous tubercles up to about a millet seed in size.

Colic Glands.—A few of the very numerous colic glands contained from one to four similar though slightly smaller tubercles.

Liver.—Just beneath the capsule of the liver, there were two nodules composed of soft grey translucent tissue, the size of a millet seed and a hemp seed respectively.

Portal Glands.—There was an opaque focus in a portal gland.

Suprarenal Bodies.—There were two small yellow bodies projecting from the left suprarenal body.

Thorax.

Lungs.—In the right lung just beneath the pleura there was a firm grey translucent nodule the size of a small pea.

There was no tuberculosis of any other organ or gland.

Microscopical Examinations.

(Smear preparations.)

Submaxillary Gland.—A few tubercle bacilli.

Superior Cervical Gland.—A few tubercle bacilli.

Mesenteric Gland.—Numerous tubercle bacilli.

Colic Gland.—Moderately numerous tubercle bacilli.

Liver (nodule).—No tubercle bacilli.

Suprarenal Body.—No tubercle bacilli.

PONY 30. [Aged.] Virus B. XI.

Intravenous inoculation of culture derived from the original material.

Dose—10·0 milligrammes.

Date of Inoculation—March 20, 1908.

Died—April 9, 1908. [20 days after inoculation.]

Clinical History.

The animal showed respiratory distress and loss of appetite for more than a week before death.

Temperature.

The temperature rose to 39·5° on the fourth day and 39·6° on the sixth day. It fell for a few days and again rose, the highest point reached being 40·0° C. two days before death.

Weights.

	kilos.
March 20, 1908	309·33
April 9, 1908	287·10

Total loss in weight.—22·23 kilos.

POST-MORTEM EXAMINATION.

Carcass in fair condition.

Thorax.

Lungs.—The lungs did not collapse normally; they felt firm and on section were oedematous, the left lung being also congested. The lung parenchyma was closely beset with translucent tubercles slightly opaque in the centre, the majority about the size of rape seed.

Pleura.—On the visceral and parietal pleura and on the pleural surface of the diaphragm there were numerous loosely attached whitish fibrous tissue growths, quite homogenous, the largest about 5·8 by 5 cm. in area.

Abdomen.

Spleen.—The spleen weighed 907 grammes. The substance was firm but no foci could be seen.

Liver.—The liver was congested but showed no tubercles.

Kidneys.—In the kidneys, just beneath the surface, could be seen an occasional minute grey tubercle.

In the wall of the mesenteric artery there was a necrosed patch, in which lime salts were deposited, and in which several small worms were demonstrated.

There was a similar condition in an iliac artery and in the lumen of the vessel there was an ante-mortem clot.

The majority of the lymphatic glands were oedematous, and in some the lymphoid follicles were well marked.

Microscopical Examinations.

(Smear preparations.)

Lung (substance).—Moderately numerous tubercle bacilli.

Bronchial Gland (substance). — A few tubercle bacilli.

Spleen (substance).—A few tubercle bacilli.

Liver (substance).—A few tubercle bacilli.

Small Intestine (scraping).—No tubercle bacilli.

MONKEY 214. Virus B. XI.

Fed with culture derived from Rabbit 1587.

Dose—50 milligrammes. [Administered in milk, 10 mg. a day for five days.]

Date of Feeding—April 17, 1908.

Died—May 19, 1908. [32 days after the first feeding.]

POST-MORTEM EXAMINATION.

Tongue, Tonsils, Larynx, Pharynx and Trachea.—Normal.

Submaxillary Glands.—One on the left side contained a softening yellow caseous nodule the size of a hemp seed. On the right side there was a gland containing two caseous tubercles the size of rape seed.

Retro-pharyngeal Glands.—The gland on each side was a little enlarged and almost replaced by softening caseous substance.

Cervical Glands.—Normal.

Stomach.—In the mucous membrane there was a small caseous ulcer.

Small Intestine.—All the Peyer's patches were thickened and caseous, and the internal surfaces were bright red from submucous haemorrhages A few only showed slight superficial ulceration. The mucous membrane in between the patches was beset with numerous caseous tubercles, so closely in parts as to form almost a continuous chain. In parts also there was a tendency for the nodules to encircle the gut.

Large Intestine.—Beneath the mucous membrane there were three small caseous nodules.

Mesenteric Glands.—The central glands in the mesentery had coalesced into a triangular mass, whose sides measured each about 4 cm., and which was 1·6 cm. in greatest thickness. On section the mass consisted of soft yellow caseous substance.

Mesentery.—The mesentery was contracted and contained numerous caseating tubercles and nodules up to 5 mm. in diameter. There were also caseous streaks (thickened lacteals) passing from the intestines to the mesenteric glands, many of which were continuously caseous, while others were in parts broken up into discrete tubercles.

Colic Glands.—The majority of the colic glands were normal, but an occasional one contained a caseous patch. There were caseous patches in the ileo-colic glands.

Abdomen.

Slight excess of fluid in the peritoneal cavity.

Spleen.—In the pulp there was a single minute grey tubercle.

Liver.—On the surface, just beneath the capsule, there were sparsely scattered opaque slightly yellowish tubercles (15 counted) varying up to a rape seed in size. On section through the substance the tubercles were rather more sparsely scattered.

Kidneys.—Normal.

Thorax.

Lungs.—The lungs did not collapse normally; the parenchyma was oedematous and emphysematous, and the right lobes were congested. In the right lung there were visible from the surface eight caseous nodules up to 3 mm. in diameter. On the left side there were seven, on the whole smaller except for one which was slightly irregular and measured about 5 mm. in greatest diameter. On section there were similar nodules scattered throughout the substance.

Bronchial Glands.—They were a little enlarged, and all contained caseous patches replacing a considerable part of the substance.

Parotid Lymphatic Glands.—The glands on the right side contained an opaque miliary tubercle.

There was no tuberculosis elsewhere.

RHESUS MONKEY 224. Virus B. XI.

Subcutaneous inoculation with culture derived from the original material.

Dose—1·0 milligramme.

Date of Inoculation—July 23, 1908

Died—August 21, 1908. [29 days after inoculation.]

POST-MORTEM EXAMINATION.

Local Lesion.—At the seat of inoculation in the subcutaneous tissues of the back there was a soft baggy cyst with five small holes in the skin, from which soft caseo-pus of a reddish-brown colour exuded. On section it was filled with brownish pus containing caseous flakes. The walls were rough with caseous material adherent to them.

Axillary Glands.—The axillary glands on both sides were enlarged and about the size of large beans, and on section were almost entirely replaced by soft yellow caseous substance. The scapular and lower cervical glands were enlarged, caseous, and softened.

Thorax.

Lungs.—The lungs were pink and crepitant; they showed a few small transparent tubercles, also a few grey tubercles with caseous centres, the largest the size of a millet seed.

Bronchial Glands.—The bronchial glands were slightly enlarged and showed soft yellow caseous nodules. At the junction of the ribs with the spine on the right side there were five soft yellow caseous nodules up to a pea in size and on the left one.

Abdomen.

Omentum.—The omentum contained one or two minute transparent glistening tubercles.

Mesenteric Glands.—There were one or two soft yellow caseous nodules in the mesenteric glands.

Intestines.—Normal.

Spleen.—The spleen was perhaps slightly enlarged, measuring 5 by 3 by 1·3 cm.; the substance was purple in colour and closely packed with greyish opaque tubercles, from a mere point up to a millet seed in size.

Liver.—The liver was closely beset with yellowish-grey tubercles ranging from a point up to a rape seed in size.

Portal Glands.—The portal glands were enlarged, yellow, caseous and softening in places.

Kidneys.—Each kidney showed one greyish opaque tubercle the size of a rape seed.

Submaxillary, Iliac, and Lumbar Glands.—Normal.

Tongue, Tonsils, Larynx, and Pharynx.—Normal.

PONY 6. [Aged.] Virus B. XII.

Subcutaneous inoculation of culture derived from the original material.

Dose—50·0 milligrammes.

Date of Inoculation—September 6, 1907.

Killed when in good general health—January 16, 1908. [132 days after inoculation.]

Clinical History.

The day after inoculation a small tumour was present, the inoculated fluid not having been absorbed. This increased in size to about a partridge's egg ; it was indefinite around the margins. Four days after inoculation the skin burst, and turbid yellowish serum flowed out, the tumour as a result almost entirely disappearing.

Temperature.

Normal throughout.

Weights.

	kilos.
September 9, 1907	355·60
January 16, 1908	362·40

Total gain of weight.—6·80 kilos.

Tuberculin Tests.

September 26, 1907. [20 days after inoculation.] Dose of tuberculin (bovine), 4·0 cc. Rise of temperature, 1·4° Centigrade. October 11, 1907. [35 days after inoculation.] Dose of tuberculin (bovine), 4·0 cc. Rise of temperature, 1·5° Centigrade.

POST-MORTEM EXAMINATION.

The animal was fat and in good condition.

Local Lesion.—In the muscle at the seat of inoculation on the left side of the neck there was an elongated tumour, measuring 3·5 by ·8 cm. On section this was composed of firm yellowish caseated tissue surrounded by translucent fibroid tissue.

Prescapular Glands.—One of the group of left prescapular glands was enlarged and firm, measuring 1·2 cm. in diameter. On section it was composed almost throughout of firm caseated tissue no appreciably gritty.

Two of the smaller glands contained a few firm caseous nodules in the cortices.

The right prescapular glands were normal.

Bronchial Glands.—In a bronchial gland there were just visible two or three minute whitish foci of a doubtful nature.

Liver.—In the liver, just beneath the surface, there were two grey nodules with opaque centres, the size of hemp seed.

There was no tuberculosis of any other organ or gland in the body.

Microscopical Examinations.

(Smear preparations.)

Local Lesion.—Three tubercle bacilli seen.

Bronchial Gland (focus).—No tubercle bacilli.

Liver (nodule).—No tubercle bacilli.

PONY 8. [Aged.] Virus B. XII.

Fed once with culture derived from the original material. [Given in its drinking water.]

Dose—100·0 milligrammes.

Date of Feeding—September 6, 1907.

Killed when in good general health—January 16, 1908. [132 days after the experiment began.]

Clinical History.

There was no sign of ill-health during the experiment.

Temperature.

Normal.

Weights.

	kilos.
September 9, 1907	377·82
January 16, 1908	375·56

Total loss of weight.—2·26 kilos.

Tuberculin Tests.

September 26, 1907. [20 days after the experiment began.] Dose of tuberculin (bovine), 4·0 cc. Rise of temperature, 1·1° Centigrade.

October 11, 1907. [35 days after the experiment began.] Dose of tuberculin (bovine), 4·0 cc. Rise of temperature, 1·3° Centigrade.

POST-MORTEM EXAMINATION.

The carcass was very fat and in good condition.

Cervical Glands.—A right superior cervical gland showed about half its substance firm and semi-opaque. Other cervical glands were normal.

Abdomen.

Intestines.—Beneath the mucous membrane of the small intestine there were four hard yellowish nodules, varying up to a pea in size.

Caecum.—At the extremity of the caecum, just beneath the peritoneum, there were two projecting fibroid nodules each of which contained on section a firm dirty-yellow necrotic centre.

There were several similar nodules scattered about the peritoneal fat.

Mesenteric Glands.—In one mesenteric gland there was a calcareous nodule about the size of a millet seed. A second showed a smaller opaque yellow gritty nodule.

Omentum.—In the omentum there were three calcareous nodules up to a hemp seed in size.

Spleen.—In the spleen just beneath the surface there was an opaque yellow nodule 3 mm. in diameter.

Liver.—Projecting from just beneath the surface of the liver were sparsely scattered irregular stony nodules, resembling those in the lung and also those described in the other horses ; they were also seen on section through the substance.

Thorax.

Lungs.—Sparsely scattered throughout the lungs, both just beneath the surface and in the depth were hard stony nodules varying up to a large pea in size. On section they consisted of a thin grey capsule from which the nodule easily shelled out ; the next coat consisted of a cartilaginous layer becoming gritty and finally calcareous in the centre.

Bronchial Glands.—Several of the bronchial glands, which were not enlarged, contained similar nodules projecting from the surface ; the largest nodule measured 5 mm. in diameter.

There was no evidence of tuberculosis in any other organ or gland.

Microscopical Examinations.

(Smear preparations.)

Lung (nodule).—No tubercle bacilli.

Liver (nodule).—No tubercle bacilli.

Omentum (nodule).—No tubercle bacilli.

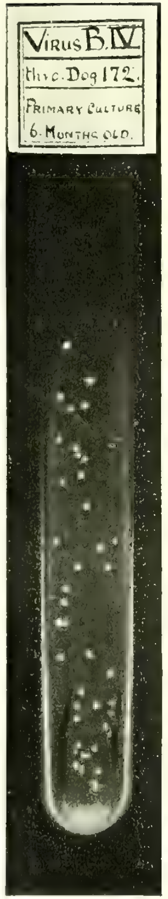
Intestine (nodule).—No tubercle bacilli.

Caecum (nodule).—One tubercle bacillus seen.

Mesenteric Gland (nodule).—Two tubercle bacilli seen.

Cervical Gland (opaque substance).—Six tubercle bacilli seen.

CULTURES OF BOVINE AND EQUINE TUBERCLE BACILLI.



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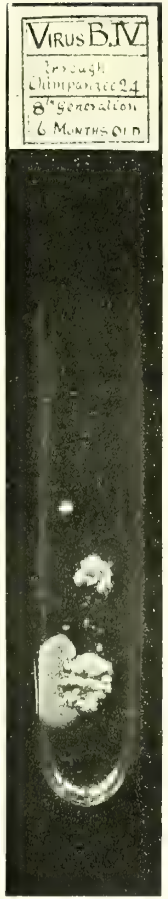

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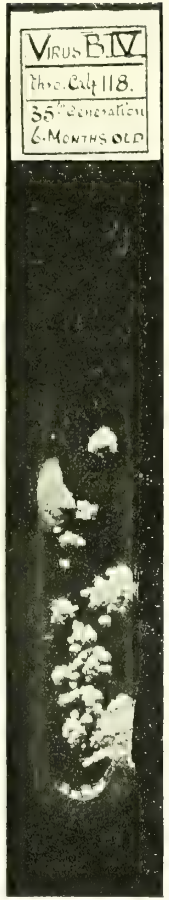

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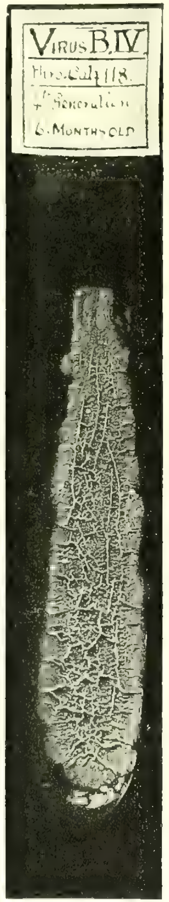

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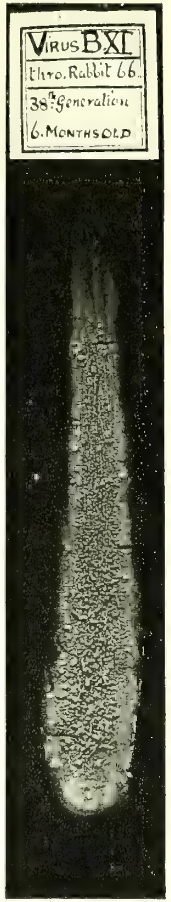

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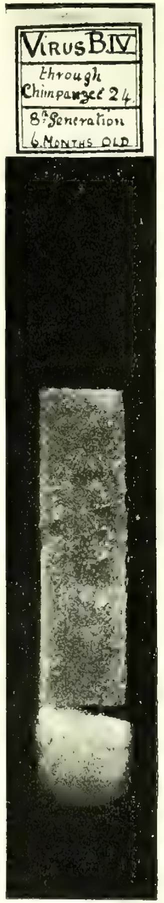

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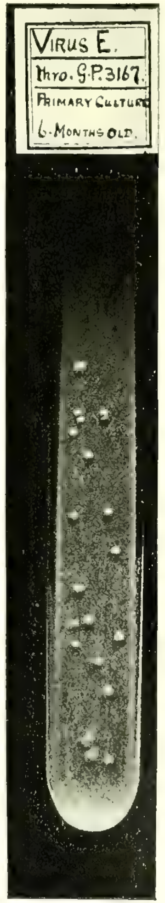

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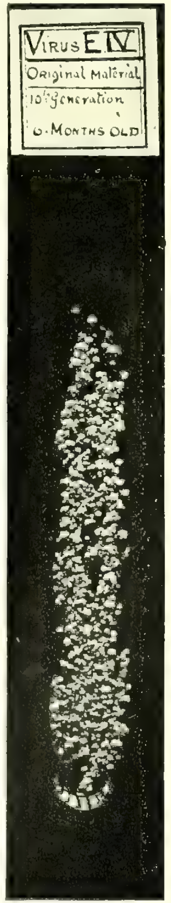

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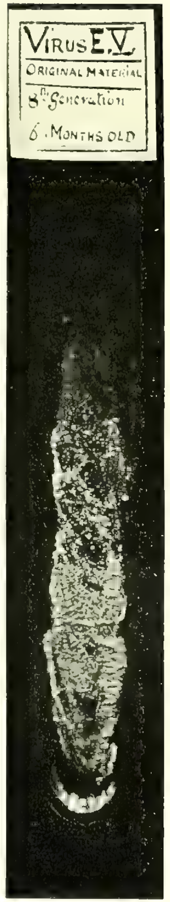

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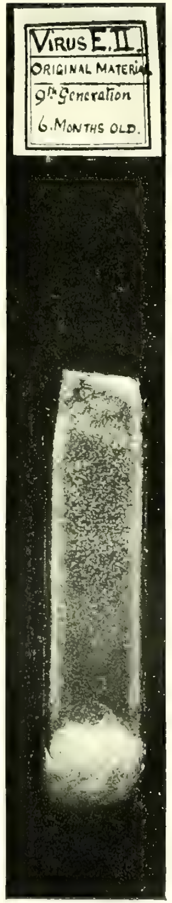

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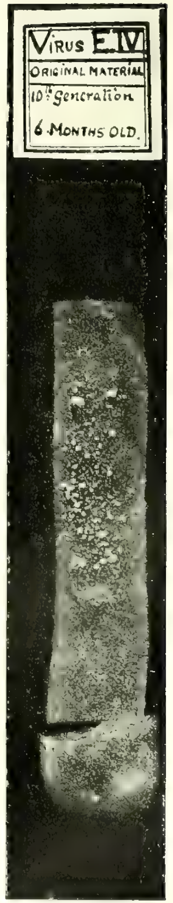

11.

1, 7. *Primary cultures on egg of bovine and equine (Virus E. IV.) tubercle bacilli.*
2, 3. *Bovine tubercle bacilli on glycerin agar: sown from cultures on pure serum.*
4, 5. *Bovine tubercle bacilli on glycerin agar: showing effect of repeated subcultivation on glycerin media.*
6, 10, 11. *Bovine and equine tubercle bacilli on glycerin potato.*
8, 9. *Growth of equine tubercle bacilli on glycerin agar.*

INVESTIGATION OF VIRUSES OBTAINED FROM CASUAL TUBERCULOSIS OF VARIOUS MAMMALS.

BY

F. GRIFFITH, M.B.

INVESTIGATION OF VIRUSES OBTAINED FROM CASUAL TUBERCULOSIS OF VARIOUS MAMMALS.

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INVESTIGATION OF VIRUSES OBTAINED FROM CASUAL TUBERCULOSIS OF VARIOUS MAMMALS.

A few cases of tuberculosis casually occurring in various mammals other than the ox, the horse, and the pig, have been investigated. The animals were a gnu, antelope, rhesus monkey, chimpanzee, and cat. The tuberculous material from the gnu and the antelope was sent by Dr. Seligmann from the Zoological Society's Gardens, and that from the cat by Sir John McFadyean; the rhesus monkey and the chimpanzee had been obtained for purposes of experiment; one was killed and the other died at the isolation station.

SUMMARY OF RESULTS.

From a Gnu which died of general tuberculosis in the Gardens of the Zoological Society a culture was obtained which resembled in growth on artificial media a human tubercle bacillus of Group II. Cultures were obtained from tuberculous lesions in three parts of the body of this animal—the lung, the mediastinal and the portal glands—and all were identical in cultural characters. The portal gland culture alone was tested on animals. This was tested on two calves subcutaneously in doses of 50 milligrammes and produced in 90 days local tuberculosis only. For rabbits it had relatively slight virulence compared with the bovine tubercle bacillus. It caused fatal general tuberculosis in two guinea-pigs.

An Antelope, which was killed in the same Gardens when ill, was found to have very extensive chronic tuberculosis of the lungs; the lung substance was riddled with communicating cavities which contained breaking down caseous substance. Cultures were isolated from this lung direct and through Guinea-pig 2164 and Rabbit 1041. All these three strains were identical and resembled a culture of a human tubercle bacillus of Group II. The direct culture was tested in doses of 50 mg. subcutaneously in two calves and caused local tuberculosis only, after 96 and 119 days respectively. Two pigs, one fed with 100 milligrammes, the other inoculated subcutaneously with 50 milligrammes, developed very slight non-progressive tuberculosis after 100 days. For rabbits it had relatively slight virulence; in four guinea-pigs it caused fatal general tuberculosis; it was not virulent for fowls. The possibility of the tuberculosis in the Antelope being due to a mixed infection of tubercle bacilli was considered and two passage experiments on rabbits and guinea-pigs were carried out, beginning with the rabbit and guinea-pig inoculated with the original material. The longest experiment, in which 12 rabbits and 6 guinea-pigs were used, lasted nearly two years from October 2, 1906, to September 1, 1908. But no alteration in cultural characters or increase in virulence for the rabbit was observed in any of the cultures recovered. *See* Report on Modification Experiments.

The two results recorded above are of interest in showing that two animals, the gnu and the antelope, belonging to the order of ruminants, have acquired casually severe tuberculosis due to infection with tubercle bacilli, which experimentally had only slight virulence for calves, and could not be distinguished culturally from human tubercle bacilli of Group II.

Cultures of slight virulence for rabbits, with the cultural characters of human tubercle bacilli of Group II., have been obtained from a Chimpanzee and from a Rhesus Monkey, also the subjects of casual tuberculosis. The Chimpanzee had acquired the disease by ingestion, the post-mortem examination showing several ulcers in the small intestine and enlargement and caseation of the mesenteric glands. The immediate cause of death was acute miliary tuberculosis of the lungs. The Rhesus Monkey had chronic pulmonary tuberculosis and slight disseminated disease.

From the mesenteric gland of a Cat affected with casual tuberculosis, a culture was isolated which grew with difficulty on the various differential media, resembling a bovine tubercle bacillus of Class 2. It was fully virulent for rabbits and guinea-pigs, and not virulent for the fowl.

VIRUS Z I

(Portal Gland of a Gnu.)

CULTURE INOCULATIONS.

February 15, 1906.

The strain used was the 4th generation, 21 days old, and had been in cultivation a total period of 87 days.

CALF 386.

Subcutaneous.

Dose : 50·0 mg.

Killed : May 16, 1906.

90 days.

P.M.—Large cyst at seat of inoculation filled with caseo-pus and crossed by fibrous trabeculae. Small brownish patch in left prescapular gland beset with calcareous foci. Left prepectoral gland partly caseo-calcareous. No tuberculosis elsewhere.

CALF 388.

Subcutaneous.

Dose : 50·0 mg.

Killed : May 16, 1906.

90 days.

P.M.—Cystic local lesion filled with caseo-pus. Left prescapular and prepectoral glands partly caseo-calcareous. A few minute transparent tubercles in the lungs. Mesenteric glands contained two caseous tubercles.

GUINEA-PIGS.

Number.	Dose.	Method of Inoculation.	Duration of Life.	Result.
1906	0·1 mg.	Intrap.	D. 13 days	G. T.
1905	0·1 mg.	Subcut.	D. 37 days	G. T.

RABBITS.

Number.	Dose.	Method of Inoculation.	Duration of Life.	Result.
759	1·0 mg.	Intrav.	D. 16 days	Acute tuberculosis.
758	0·1 mg.	Intrav.	K. 91 days	Chronic G.T.
761	1·0 mg.	Intrap.	D. 23 days	Acute tuberculosis.
760	1·0 mg.	Subcut.	K. 91 days	Cystic local lesion. Two tubercles in the inguinal glands. Discrete caseous nodules in lungs.
762	1·0 mg.	Subcut.	K. 91 days	Result similar to above.

VIRUS Z I (Gnu).

Original material—The specimens received were portions of the lung, liver, and dorsal mediastinal glands, a portal and a gastric gland, of a gnu which had died in the Gardens of the Zoological Society.

DESCRIPTION OF MATERIAL RECEIVED AT THE FARM.

The material was taken from a female gnu which died of general tuberculosis on November 19, 1905.

The piece of lung was quite solid, very dense and was composed of closely packed opaque white nodules embedded in a matrix of fibrous tissue ; the nodules varied in size up to a small pea and were dense, caseous, and slightly gritty in the centre ; a few were softened.

The dorsal mediastinal gland was very dense and similarly beset with fibro-caseous gritty nodules.

The liver contained scattered hard caseo-calcareous nodules, ranging in size from a millet seed to a wheat grain.

The portal gland was enlarged and showed numerous hard discrete spherical whitish nodules, the largest the size of a pea ; they projected above the surface and were surrounded by thin fibrous capsules from which the tough caseated tissue could readily be shelled ; the nodules were appreciably gritty from calcification.

The gastric gland was enlarged and contained coalescing caseating tubercles.

CULTURES.

Cultures were obtained direct from the lung, mediastinal gland, and portal gland. Cultures were also isolated from Guinea-pig 1779 and Rabbit 520, inoculated with the lung and mediastinal gland respectively. Growth occurred readily in primary culture, both on glycerin serum and glycerinated potato.*

The subcultures obtained directly from the lung, mediastinal gland and portal gland, as well as those from the rabbit and from the guinea-pig, were tested in the usual way on the various differential media and all grew in an identical manner. The growth on glycerin serum was thick, wrinkled, and more luxuriant than that on pure serum ; on glycerin agar and potato it was thick, wrinkled, and slightly pigmented ; on glycerin gelatin and broth opaque wrinkled and warty pellicles were formed.

INOCULATION EXPERIMENTS.

(*a*) With the original material from a Gnu.

Rabbits.—Rabbit 519 was inoculated *intraperitoneally* with an emulsion made from the lung. It was killed after 41 days, in good condition. The omentum was slightly thickened by reddish-grey tissue, beset with caseous foci ; there were scattered whitish miliary tubercles on the mesentery, mesocolon and meso-caecum. There were yellowish tubercles up to 1 mm. in the spleen and a few grey tubercles in the liver and kidneys, those in the latter caseating. The lungs showed moderately numerous grey miliary tubercles with little central caseation. Caseous foci or patches in the inguinal, lumbar, coeliac, portal, and bronchial glands.

Rabbit 520 was inoculated *intraperitoneally* with an emulsion of the mediastinal gland and died after 181 days. The omentum contained numerous caseo-calcareous and glassy tubercles ; a few also on the mesentery. Spleen normal. Each kidney showed about a dozen tubercles with caseous centres up to 3 mm. in diameter ; there were a few caseous streaks in the pyramids. The lungs did not quite collapse ; they contained numerous irregular caseous gritty nodules and the margins of all the lobes were caseated. A few tubercles in the liver and one in each suprarenal body. Caseous foci in the mesenteric, bronchial, and axillary glands.

Guinea-pigs. — Guinea-pig 1779 was inoculated *intraperitoneally* with an emulsion of the lung of the Gnu and died in 43 days of general tuberculosis.

Guinea-pig 1780 was inoculated *intraperitoneally* with an emulsion of the mediastinal gland and died of general tuberculosis in 37 days.

(*b*) With culture of Gnu material.

Calves.—Calves 386 and 388 were inoculated subcutaneously each with 50 mg. of culture derived from the portal gland of the Gnu. They were killed in good health after 90 days. Each showed at the seat of inoculation a non-infiltrating cystic tumour filled with caseo-pus, and slight tuberculosis of the nearest lymphatic glands. The animals were otherwise healthy with the exception of a few transparent tubercles in the lungs and two tubercles in the mesenteric glands of Calf 388.

Rabbits. — Two rabbits were inoculated *intravenously*, No. 759 with 1·0 mg., No. 758 with 0·1 mg. of culture derived from the portal gland.

Rabbit 759 died in 16 days of acute tuberculosis (numerous tubercle bacilli in smears from the liver and spleen substance).

Rabbit 758 was killed 91 days after inoculation, and had fairly severe chronic tuberculosis. The lungs contained numerous discrete tubercles aggregated in the margin and on the dorsal surfaces of the caudal lobes beneath the pleura. Spleen showed moderately numerous yellowish tubercles. The surfaces of the kidneys were pitted and beset with caseous foci, and the medullae contained caseous streaks ; some of the calyces of the right were filled with caseo-pus. Moderately numerous grey tubercles in the liver. The majority of the lymphatic glands contained discrete caseous tubercles, and there were scattered tubercles in the muscles.

Rabbit 761 died of acute tuberculosis 23 days after the *intraperitoneal* inoculation of 1·0 mg. of culture from the portal gland of the Gnu.

Rabbits 760 and 762 were inoculated *subcutaneously*, each with 1·0 mg. of this culture, and were killed after 91 days. Both showed caseous cystic local lesions and soft caseous tubercles in the nearest glands. Their lungs contained scattered firm caseating nodules up to a pea in size. There was no tuberculosis elsewhere.

Guinea-pigs.—Two guinea-pigs, Nos. 1905 and 1906, were each inoculated with 0·1 mg. of culture from the portal gland ; the former *subcutaneously*, the latter *intraperitoneally*. Guinea-pig 1905 died in 37 days, and Guinea-pig 1906 in 13 days, both of general tuberculosis.

CALF 386 Virus Z I.

Subcutaneous inoculation of culture derived from the portal gland of a gnu.

Dose—50 milligrammes.

Date—February 15, 1906.

Weight at inoculation—67·57 kilogrammes. [Age about 14 weeks.]

Killed when in good health—May 16, 1906. [90 days after inoculation.]

Clinical Notes.

A week after the inoculation on the left side of the neck, there was a slightly-raised local thickening measuring 7·5 by 6 cm. The adjacent prescapular and prepectoral glands were slightly enlarged.

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* Cultures with which the animal inoculations were made were grown primarily on egg and subcultivated on pure serum.

On the 23rd day the local swelling measured 10·9 cm.; it was slightly raised, being about 2·5 cm. in thickness. The prescapular gland was enlarged, 6·5 cm. in length; the prepectoral was also enlarged to about the size of a walnut. The swelling subsequently became soft and fluctuating. The calf showed no sign of ill-health during the experiment; it was killed 90 days after inoculation.

Temperature.

There was a slight rise of temperature, commencing on the fourteenth day, reaching a maximum of 40·0° C. on the twentieth day, and lasting under three weeks. Subsequently the temperature was quite normal.

Tuberculin Test.

The calf was not tested subsequent to inoculation.

Weights.

	Kilos.
February 15, 1906	67·57
March 20, 1906...	78·00
April 18, 1906	85·25
May 15, 1906	92·51

Total gain of weight during experiment.—24·94 kilos.

Average rate of gain per week.—1·91 kilos.

POST-MORTEM EXAMINATION OF CALF 386.

Carcass in very good condition.

Local Lesion.—In the subcutaneous tissues on the left side of the neck there was an oval fluctuating swelling, measuring 12·5 by 10 by 7·5 cm., and weighing with the skin attached to it about 453 grammes. On section the swelling was found to be an abscess with fibrous walls, varying in thickness up to 6 mm., and with purulent and caseo-purulent contents. The cavity was crossed by numerous fibrous trabeculae, the largest the diameter of a cedar-wood pencil; these and the internal surface of the cyst wall were covered by a thin layer of pale granulation tissue, over which were distributed numerous calcareous grains. The outer wall of the abscess was adherent to the muscles and to the skin, the latter being slightly thickened.

Left Prescapular Gland.—The left prescapular gland was a little enlarged, and measured 6 by 3 cm. by a little over 1 cm.; on section towards one extremity of the gland a small part of the cortex was firm, brownish, and translucent, and closely beset with calcareous foci; the capsule about the middle of this patch showed a dense white fibrous thickening, which penetrated into the cortex in a wedge-shaped manner; the rest of the gland, except for numerous petechial haemorrhages, appeared normal.

Right Prescapular Gland.—The right prescapular gland measured 5 by 2·5 by 1·2 cm., and was normal on section.

Prepectoral Glands.—On the left side the spherical gland was enlarged to the size of a Barcelona nut; on section the peripheral part of the gland was composed of tough caseated tissue, gritty around the margins, the central part of brownish translucent and whitish fibroid tissue beset with calcareous foci. Two other glands on this side were normal.

The glands on the right side were normal.

Cervical Glands.—Normal.

Thorax.

Heart and Pericardium.—Normal.

Pleura.—Normal.

Lungs.—Normal.

Bronchial and Mediastinal Glands.—Normal.

Larynx and Trachea.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—The spleen weighed 339 grammes, and was normal on the surface and on section.

Liver.—In the depth of the liver substance there was one minute yellow focus; otherwise the liver was normal.

Gall-bladder.—Normal.

Portal Glands.—Normal.

Kidneys.—Both kidneys showed on the surface a number of minute grey foci, not apparently of a tuberculous nature.

Suprarenal Bodies.—Normal.

Special Organs.

Tongue, Pharynx, and Tonsils.—Normal.

Small and Large Intestines.—Normal.

Testes.—Normal.

Eyes.—Normal.

Various Lymphatic Glands.

Submaxillary, Parotid, Pharyngeal, Axillary, Coeliac, Renal, Lumbar, Iliac, Precrural, Pudic, Popliteal, Gluteal, Ischiatic, Gastric, Mesenteric, and Colic Glands.—Normal.

CALF 388. Virus Z I.

Subcutaneous inoculation of culture derived from the portal gland of a gnu.

Dose—50 milligrammes.

Date—February 15, 1906.

Weight at Inoculation—62·58 kilogrammes. [Age about 13 weeks.]

Killed when in good health—May 17, 1906. [91 days after inoculation.]

Clinical Notes.

A week after the inoculation on the left side of the neck there was a flattened swelling measuring 7·5 by 6 cm. The adjacent prescapular and prepectoral glands were slightly enlarged.

On the 15th day the swelling was elongated 16·5 by 8 cm. The prescapular gland was definitely enlarged, 7·5 cm. in length.

On the 54th day the swelling was cystic and measured 15 by 7·5 cm.; the prescapular gland measured 7·5 cm. in length, and the prepectoral gland was the size of a large pea.

No further change of any importance took place in the local conditions.

The calf showed no symptoms of illness during the experiment.

Temperature.

There was a slight rise of temperature commencing on the 12th day, and lasting three weeks. The highest temperature recorded was 39·8° C. Subsequently the temperature was quite normal

Tuberculin Test.

The calf was not tested subsequent to inoculation.

Weights.

	Kilos.
February 15, 1906	62·58
March 20, 1906	70·74
April 18, 1906	79·36
May 15, 1906	88·43

Total gain of weight during experiment.—25·85 kilos.

Average rate of gain per week.—1·98 kilos.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a prominent fluctuating swelling, measuring 14 cm. in length and 9 cm. in breadth and thickness, and weighing with the attached skin 537 grammes. On section, the swelling was found to be a cyst, with fibrous walls up to 7 mm. in thickness, filled with greenish-yellow pus in which were suspended a few small, partially softened, caseous masses; internally, the cavity was lined by a thin layer of pale smooth granulation tissue, the surface of which was covered with small gritty particles; crossing the cavity, chiefly at the extremities, were a few bands of fibrous tissue.

Left Prescapular Gland.—The left prescapular gland measured 6 by 4 cm. by about 2 cm.; on section, about half the substance of the gland was composed of calcareo-caseous material with a scanty matrix of brownish translucent fibroid tissue; several of the more caseous parts showed foci of softening; the rest of the gland was normal.

Right Prescapular Gland.—The right prescapular gland measured 5 by 2·5 by 1·2 cm. and was normal on section.

Prepectoral Glands.—On the left side one gland, the size of a swallow's egg, was indurated, and on section composed of fibroid tissue beset with calcareo-caseous foci closely aggregated around the periphery of the gland. Other glands on this side as well as those on the right were normal.

Cervical Glands.—Normal.

Thorax.

Heart and Pericardium.—Normal.

Pleura.—Normal.

Lungs.—The lungs were normal in general appearance. In the right anterior lobe under the pleura two minute (each about 0·5 mm. in diameter) glassy tubercles were seen. In each of the caudal lobes there were half-a-dozen transparent subpleural tubercles, the largest about 0·75 mm. in diameter; the majority of the latter tubercles had a minute yellow calcareous centre. In the other lobes, and on section of the lung, no tubercles were seen.

Bronchial and Mediastinal Glands.—Normal.

Larynx and Trachea.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—The spleen weighed 226 grammes and was normal on the surface and on section.

Liver.—Normal.

Gall-bladder.—Normal.

Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Special Organs.

Tongue, Pharynx, and Tonsils.—Normal.

Small and Large Intestines.—Normal.

Testes.—Normal.

Eyes.—Normal.

Various Lymphatic Glands.

Submaxillary, Parotid, Retro-pharyngeal, Axillary, Coeliac, Renal, Lumbar, Iliac, Precrural, Popliteal, Gluteal, Ischiatic, Gastric and Colic Glands.—Normal.

Mesenteric Glands.—A gland in the anterior part of the mesentery showed in the cortex a minute yellow point; one in the posterior part contained a hempseed-sized grey tubercle, slightly opaque in the centre.

VIRUS Z III (Antelope).

Original material—The specimen received was the lung of an antelope (Oryx Beisa), which was killed at the Zoological Society's Gardens on October 2, 1906. The animal had been at the Gardens since July 1, 1898.

DESCRIPTION OF MATERIAL RECEIVED AT THE FARM.

The specimen sent was the lung. It was extensively diseased, the greater part of it being riddled with communicating cavities, separated by trabeculae of congested tissue; the cavities contained muco-pus in the centre, and a more solid caseo-pus on the walls; the tissue around was grey and solid. Other parts of the lung were crepitant, but deeply congested and oedematous, showing also scattered grey foci. In many of the grey areas mentioned above, a caseous yellow network was seen. A smear from the muco-pus showed numerous tubercle bacilli, also other organisms.

CULTURES.

Cultures were obtained direct from the lung, and from Guinea-pig 2164 and Rabbit 1041 inoculated with the original material.

All the strains were identical, and grew luxuriantly on the differential media; they produced thick pigmented, wrinkled, and warty growths on glycerin agar and glycerinated potato, and thick opaque wrinkled pellicles on glycerin broth and glycerin gelatin.

INOCULATION EXPERIMENTS.

(*a*) With the original material from the Antelope.

Rabbit.—Rabbit 1041 was inoculated intraperitoneally with an emulsion made from the lung, and was killed 97 days later. There were a few tubercles in the omentum and on the peritoneum, and a purulent nodule loosely attached to the caecum. In the kidneys there were a few caseating tubercles up to a millet seed. Spleen and liver normal. The lungs were congested and contained numerous grey nodules with caseous streaks up to 3 mm. in diameter. Caseous foci in lumbar, iliac, mediastinal and mesenteric glands.

Guinea-pigs.—Guinea-pig 2164 was inoculated subcutaneously, and Guinea-pig 2165 intraperitoneally, with an emulsion of the lung. Guinea-pig 2164 died in 43 days of general tuberculosis. Guinea-pig 2165 was killed after 76 days, and had chronic general tuberculosis.

(*b*) With culture from Antelope material.

Calves.—Two calves, Nos. 510 and 516, were inoculated *subcutaneously*, each with 50 mg. of culture. Calf 510 was killed when well after 96 days, and showed at the post-mortem examination a cystic caseo-purulent local lesion and slight tuberculosis of the nearest glands without any disease elsewhere. Calf 516, killed after 122 days, was similarly slightly affected with the addition of a focus in a mesenteric and in a submaxillary gland.

Pigs.—Pig 174 was inoculated *subcutaneously* with 50 mg. of culture; it died without obvious cause 111 days after inoculation. There was a caseo-purulent cyst at the seat of inoculation, and caseation of the inguinal, precrural, and ventral mediastinal glands, without any disease elsewhere.

Pig 170 was *fed* with 100 mg.; when killed in good health after 119 days it showed discrete caseous gritty nodules in the submaxillary and mesenteric glands, and tubercles in the coeliac and portal glands. There were three minute tubercles in the lungs, but no tuberculosis elsewhere.

Rabbits.—The culture was inoculated into rabbits after it had been subcultured a total period of 90 days.

Two rabbits were inoculated *intravenously*. Rabbit 1166 received 0·1 mg., and died in 74 days of general tuberculosis; at the post-mortem examination the lungs did not collapse normally, and contained numerous irregular caseous nodules which at the caudal extremities became confluent and replaced the lung tissues by diffusely caseous masses. The spleen contained a moderate number of minute opaque tubercles, and the liver contained greyish white foci. Moderately numerous caseous tubercles up to a rape seed in size in the kidneys. Caseous tubercles in the majority of the lymphatic glands, in the muscles of thighs and back, and in the tips of the vertebral spinous processes.

Rabbit 1167 received 1·0 mg. and died after 201 days. The lungs were congested and oedematous, and at the caudal extremities there were caseo-purulent cystic nodules replacing a considerable part of the substance, and smaller whitish gritty nodules scattered about the rest of the lungs. The kidneys were pitted and scarred, and on section there were caseous streaks and tubercles in the pyramids; both pelves contained soft caseous substance. In the tissue beneath each nipple there were collections of caseo-purulent cysts, and the spinous processes and the crests of the iliac bones contained caseous areas.

Two rabbits were inoculated *intraperitoneally* with culture. Rabbit 1169 received 10 mg. and died of acute tuberculosis in 18 days. Rabbit 1168 was inoculated with 1·0 mg., and was killed 391 days later; in the omentum there was a single small caseous nodule, and a few on the peritoneum. The lungs did not collapse normally; the caudal half of the right posterior lobe was almost replaced by cystic nodules filled with muco-pus, while the rest of the lung contained fairly numerous discrete grey nodules with caseous centres. There were a few submiliary tubercles in the kidneys. The spleen was normal. A few doubtful tubercles were seen in the liver. The testis and vas deferens on each side were greatly enlarged and replaced by soft caseous substance.

Three rabbits were inoculated *subcutaneously*. Rabbit 1172 received 50 mg. and was killed 111 days later; the local lesion was large and cystic, the skin over it being intact; adjacent lymphatic glands were normal. The kidneys contained a few minute grey tubercles with opaque centres. The lungs showed on the surfaces moderately numerous grey nodules with caseous foci. There was no tuberculosis elsewhere.

Rabbit 1171 received 10 mg. and was killed after 184 days; it showed a cystic local lesion and a single tubercle in the lungs without any disease elsewhere.

Rabbit 1170 died 93 days after the inoculation of 1·0 mg. and had slight tuberculosis. There was a caseo-purulent local lesion but no tuberculosis of the adjacent lymphatic glands. In the lungs, which were pink and crepitant, there were about two dozen caseating nodules ranging up to a wheat grain in size.

Three rabbits were tested with the culture after it had been in cultivation for a total period of 126 days.

Rabbits 1239 and 1240 each received 10 mg. *intraperitoneally*. Rabbit 1240 died in 21 days of acute tuberculosis. Rabbit 1239 was killed after 95 days having gained 1,000 grammes in weight. At the post-mortem examination the omentum contained caseo-purulent nodules up to a haricot bean in size, and there were similar nodules scattered about the peritoneal cavity. The surfaces of the kidneys were irregular and pitted and the cortices were closely filled with grey nodules with caseous centres; there were soft caseous streaks in the pyramids, and the pelvis of one kidney was filled with caseo-pus. The lungs did not collapse normally and were severely diseased; the dorsal surfaces of both lungs were replaced by a network of caseous tissue; the anterior lobes were reddish and solid. Only in the centre of the ventral portions of the caudal lobes was there any crepitant lung tissue remaining. There was no tuberculosis of spleen or liver. Caseation of lumbar and mediastinal glands and tubercles in the areolar tissues—axillary, inguinal, &c.

Rabbit 1241 was *fed* with 50 mg. and killed after 245 days. At the post-mortem examination the intestines and mesenteric glands were normal. There was a minute tubercle in a kidney. The lungs showed at both anterior extremities grey wedge-shaped nodules beset with caseous foci; there were caseous, gritty, marginal nodules and scattered nodules in the rest of the substance. There was no tuberculosis elsewhere. (Cultures obtained from the lung proved identical with that used for feeding.)

VIRUS Z III.

CULTURE INOCULATIONS.

LUNG OF AN ANTELOPE.

I.—February 7, 1907.

The strain was derived from the lung direct.

The culture used was the 8th generation, 22 days old, and had been in cultivation a total period of 126 days.

CALF 510.
Subcutaneous.
Dose : 50·0 mg.
Killed : May 14, 1907.
96 days.

P.M. — Large cystic local lesion filled with purulent fluid and caseous flakes. Right prescapular gland contained a few caseo-calcareous tubercles ; right cervical partly caseo-calcareous. No tuberculosis elsewhere

CALF 516.
Subcutaneous.
Dose : 50·0 mg.
Killed : June 10, 1907.
122 days.

P.M. — Cystic caseo-purulent local lesion. Small collection of caseous gritty tubercles in right prescapular gland ; right superior and inferior cervical glands similar. A gritty focus in a mesenteric and submaxillary gland. No tuberculosis elsewhere.

PIG 170.
Fed.
Dose : 100·0 mg.
Killed : June 7, 1907.
119 days.

P. M. — Submaxillary glands contained discrete caseous gritty nodules. Mesenteric glands similar. Gritty tubercles in coeliac and portal glands. The lungs showed three minute tubercles. No tuberculosis elsewhere.

PIG 174.
Subcutaneous.
Dose : 50·0 mg.
Died : May 30, 1907.
111 days.

P.M.—Cyst at seat of inoculation filled with caseo-pus. Left inguinal, precrural and ventral mediastinal glands partly caseo-necrotic. No tuberculosis elsewhere.

RABBITS.

Number.	Dose.	Method of Inoculation.	Duration of Life.	Result.
1239	10·0 mg.	Intrap.	D. 95 days	Chronic G. T. Severe in lungs.
1240	10·0 mg.	Intrap.	D. 21 „	Acute T.
1241	50·0 mg.	Fed	K. 245 „	Caseous nodules in the lungs only.

GUINEA-PIG 2733.
Intraperitoneal.
Lung nodule from Rabbit 1241.
Died : 40 days.

P.M.—General tuberculosis.

II.—January 2, 1907.

The strain was derived from the original material.

The culture used was the 6th generation, 21 days old, and had been in cultivation a total period of 90 days.

GUINEA-PIGS.

Number.	Dose.	Method of Inoculation.	Duration of Life.	Result.
2276	1·0 mg.	Intrap.	D. 12 days	G. T.
2274	0·1 mg.	Intrap.	D. 23 „	G. T.
2275	1·0 mg.	Subcut.	D. 46 „	G. T.
2273	0·1 mg.	Subcut.	D. 60 „	G. T.

RABBITS.

Number.	Dose.	Method of Inoculation.	Duration of Life.	Result.
1167	1·0 mg.	Intrav.	D. 201 days	Chronic T
1166	0·1 mg.	Intrav.	D. 74 „	G. T.
1169	10·0 mg.	Intrap.	D. 18 „	Acute T.
1168	1·0 mg.	Intrap.	K. 391 „	Chronic T.
1172	50·0 mg.	Subcut.	K. 111 „	Slight G. T.
1171	10·0 mg.	Subcut.	K. 184 „	Local T. and a single tubercle in lungs.
1170	1·0 mg.	Subcut.	D. 93 „	Slight G. T.

III.

The culture was the 4th generation, 5 days old, and had in cultivation a total period of 721 days.

FOWLS.

Number.	Dose.	Method of Inoculation.	Duration of Life.	Result.
474	10·0 mg.	Intrap.	K. 77 days	No tuberculosis.
476	47·0 mg.	Intramuscular.	D. 14 „	No tuberculosis

Guinea-pigs.—Two guinea-pigs were inoculated *intraperitoneally* with 1·0 mg. and 0·1 mg. respectively, the former dying in 12 days, the latter in 23 days with general tuberculosis. Two guinea-pigs were inoculated *subcutaneously*, one with 1·0 mg. the other with 0·1 mg. and both succumbed to general tuberculosis in 46 days and 60 days respectively.

Fowls.—Fowl 474 was inoculated *intraperitoneally* with 10 mg. of culture, and when killed in 77 days was perfectly healthy.

CALF 510. Virus Z III.

Subcutaneous inoculation with culture derived from the original material.

Dose—50 milligrammes.

Date of Inoculation—February 7, 1907. [Age about 9 weeks.]

Killed when in good general health—May 14, 1907. [96 days after inoculation.]

Clinical History.

There was no sign of ill-health during the experiment.

Temperature.

The temperature was slightly raised during the first three weeks, highest point 39·9, after which it fell and remained normal until death.

Tuberculin Test.

April 30, 1907, 82 days after the experiment began. Dose of tuberculin (Bovine), 2·0 cc. Rise of temperature, 1·5° C.

Weights.

	Kilos.
February 7, 1907	78·90
May 14, 1907	106·11

Total gain in weight.—27·21 kilos.

POST-MORTEM EXAMINATION OF CALF 510.

General condition good.

Local Lesion.—At the seat of inoculation on the right side of the neck there was a prominent fluctuating tumour measuring 15 by 10 by 9 cm., and weighing 622 grammes. On section it was a cyst, tense with yellow purulent fluid containing small caseous flakes. The walls were lined by slightly roughened and pitted grey granulation tissue in which were a few gritty projecting points, and they were crossed by smooth fibrous cords up to 8 mm. in thickness.

Prescapular Glands.—The right prescapular gland measured 6·5 by 3 by 1·4 cm. On section through the middle it appeared normal. A further superficial slice of cortex revealed two gritty foci and a small collection of caseo-calcareous tubercles the size of a wheat-grain. The left prescapular gland measured 5·2 by 2·7 by 1·1 cm. On section it was normal.

Prepectoral Glands.—Normal.

Cervical Glands.—The right inferior cervical gland felt firm, and measured 1·3 by 1·8 by 1 cm. On section the greater part of the gland was filled with a fine caseo-calcareous network, and there was also an irregular caseous patch with calcareous streaks, mainly firm but softening at one point near the cortex.

Other cervical glands were normal.

Spleen.—The spleen weighed 339 grammes, and on section was normal.

All other organs and glands were normal.

Microscopical examination of a smear preparation from the emulsion of cervical gland showed a few tubercle bacilli.

CALF 516. Virus Z III.

Subcutaneous inoculation with culture derived from the original material.

Dose—50 milligrammes.

Date of Inoculation—February 7, 1907. [Age about 9 weeks.]

Killed when in good general health—June 10, 1907. [123 days after inoculation.]

Temperature.

Slightly raised during earlier part of experiment; highest point 39·7; it quickly fell and remained normal until death.

Tuberculin Test.

April 30, 1907, 81 days after the experiment began. Dose of tuberculin, 2·0 cc. (Bovine). Rise of temperature, 1·1° C.

Weights.

	Kilos.
February 7, 1907	56·23
June 10, 1907	64·85

Total gain in weight—8·52 kilos.

POST-MORTEM EXAMINATION OF CALF 516.

General condition good.

Local Lesion.—At the seat of inoculation in the subcutaneous tissues on the right side of the neck there was a tumour measuring 8 by 6 by 4 cm. On section it was a moderately thick-walled fibrous cyst filled with mucoid caseo-pus and serous fluid; the internal walls were roughened and lined by grey granulation tissue, which was beset with gritty foci.

Prescapular Glands.—The right prescapular gland measured 5 by 2·4 by 1 cm. On section it contained just beneath the capsule a small collection of soft slightly gritty caseous nodules up to a millet seed in size, and an occasional opaque focus in the rest of the gland.

The left prescapular gland measured 5 by 2·4 by 1·2 cm. On section it was normal.

Prepectoral Glands.—Normal.

Cervical Glands.—The right inferior cervical gland measured 1·8 by 1·3 by 1 cm., and on section resembled the right prescapular gland.

In the cortex of the right superior cervical gland there were two irregular soft caseous gritty tubercles.

Lungs.—The lungs showed on the surface an occasional congested lobule without any sign of tuberculosis. On section there were numerous congested patches slightly oedematous, but air-containing.

Lymphatic Glands.—In an anterior mesenteric gland there was a single caseous gritty focus. There were two opaque foci in the left submaxillary gland.

There was no sign of tuberculosis in any other organ or gland.

Microscopical examination of a smear preparation of the emulsion of right inferior cervical gland showed numerous tubercle bacilli.

PIG 170. Virus Z III.

Fed with culture derived from the original material.

Dose—100 milligrammes.

Date of Feeding—February 8, 1907. [Age about 10 weeks.]

Killed when in good general health—June 7, 1907. [119 days after the experiment began.]

Temperature.

Normal throughout.

Tuberculin Test.

April 30, 1907, 81 days after the experiment began. Dose of tuberculin (Bovine) 2·0 cc. Rise of temperature 1·0° C.

Weights.

	Kilos.
February 8, 1907	10·43
June 7, 1907	32·19

Total gain in weight.—21·76 kilos.

POST-MORTEM EXAMINATION OF PIG 170.

General condition good.

Tongue.—Normal.

Pharynx.—Normal.

Tonsils.—In each tonsil there were a few soft opaque yellow foci (? secretion), no tubercle bacilli found.

Submaxillary Glands.—The submaxillary glands on the right side, anterior to the salivary gland, the largest measuring 2 by 8 cm. in thickness, contained several softening caseous nodules with fine gritty streaks replacing a considerable part of the gland substance. In the rest of the gland substance there were discrete caseo-calcareous tubercles. The nodules and tubercles were easily picked out.

One of the corresponding glands on the left side was enlarged and similarly beset with nodules; the others showed a few discrete yellowish tubercles the size of rape seed.

Cervical Glands.—Several smaller glands on each side of the neck posterior to the submaxillary salivary glands were normal.

Parotid Glands.—Normal.

Abdomen.

Intestines.—Normal.

Mesenteric Glands.—The mesenteric glands all contained discrete softening caseous slightly gritty nodules, the majority the size of a millet seed, but ranging up to a hemp seed.

Coeliac Glands.—Two showed a few opaque yellow gritty foci. A small gland attached to the pancreas showed similar foci.

Spleen.—Normal.

Liver.—On the surface of the liver there were two grey points. On section the substance was normal.

Portal Glands.—In one portal gland there was a yellowish gritty submiliary tubercle

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Thorax.

Lungs.—On the surface of the right lung just beneath the pleura there were two grey tubercles, one opaque in the centre. On the surface of the left lung there were also two. On section through the substance, a single yellowish gritty tubercle was found in the left lung.

Bronchial Glands.—Normal

All other organs and lymphatic glands were normal.

Microscopical Examinations.

(Smear Preparations)

Tonsil (foci).—No tubercle bacilli.

Mesenteric Gland (nodule).—No tubercle bacilli.

Coeliac Gland (focus).—No tubercle bacilli.

Liver (focus).—No tubercle bacilli.

PIG 174. Virus Z III.

Subcutaneous inoculation with culture derived from the original material.

Dose—50 milligrammes.

Date of Inoculation—February 8, 1907. [Age about 10 weeks.]

Died—May 30, 1907. [111 days after inoculation.]

Temperature.

The temperature was practically normal throughout (39·6 highest point).

Tuberculin Test.

April 30, 1907. [81 days after the experiment began.] Dose of tuberculin (Bovine), 2·0 cc. No reaction.

Weights.

	Kilos.
February 8, 1907	13·60
May 30, 1907	37·18

Total gain in weight.—23·58 kilos.

POST-MORTEM EXAMINATION OF PIG 174.

Local Lesion.—In the subcutaneous tissues of the abdomen to the left of the middle line there was a rounded slightly prominent tumour, 3 cm. in diameter. On section it was found to be a cyst with smooth internal walls filled with yellow caseo-pus.

In the subcutaneous tissues around there were some scattered discrete fibro-caseous tubercles.

Inguinal Glands.—One left inguinal gland measured 2·3 by 1·5 cm. and consisted almost throughout of pinkish caseo-necrotic tissue slightly gritty in parts.

Four smaller glands were normal.

The right inguinal glands were normal.

Precrural Glands.—The left precrural gland was two-thirds replaced by pinkish caseo-necrotic substance; the other third consisted of soft yellow slightly gritty material.

The right precrural gland was normal.

Diaphragm.—On the peritoneal surface of the diaphragm on both sides of the central tendon there were several flattened grey translucent nodules, some slightly opaque in the centre and about 1 mm. in diameter.

On the pleural surface on the left side there were two similar nodules.

Lungs.—The lungs were congested and oedematous but floated in water. Just beneath the pleura on the surface were scattered minute glassy foci, a few of which showed minute opaque centres.

Bronchial Glands.—Normal.

Ventral Mediastinal Glands.—The left ventral mediastinal gland was enlarged, congested, and partly replaced by a caseo-necrotic slightly gritty nodule.

The right gland was normal.

Spleen.—Normal.

Liver.—The convex surface of the liver was covered with a lace-like network of fine greyish white fibres which could be picked up and stripped away. The substance of the liver was deeply congested.

Kidneys.—The pelvis of the left kidney was dilated and the cortex contained two cysts filled with fluid. The kidneys showed no tuberculous lesions.

Coeliac Glands.—Normal.

Iliac Glands.—In a left iliac gland at one extremity the substance was a little firm and showed some opaque yellow streaks.

Brain.—Normal.

There was no sign of tuberculosis elsewhere in the body.

Microscopical Examinations.

(Smear Preparations.)

Lung (foci).—No tubercle bacilli.

E. of Left Precrural Gland.—A few tubercle bacilli.

Iliac Gland (foci).—One doubtful tubercle bacillus.

Liver (substance).—No tubercle bacilli.

VIRUS Z IV (Rhesus Monkey).

CULTURE INOCULATIONS.

LUNG.

MAY 4, 1907.

The culture used was derived from the original material.

The 13th generation; 22 days old, and had been in cultivation a period of 463 days.

GUINEA-PIGS.

Number.	Dose.	Method of Inoculation.	Duration of Life.	Result.
2468	1·0 mg.	Intrap.	D. 25 days	G. T.
2467	1·0 mg.	Subcut.	D. 108 „	G. T.

RABBITS.

Number.	Dose.	Method of Inoculation.	Duration of Life.	Result.
1326	10·0 mg.	Intrav.	D. 22 days	G. T.
1325	1·0 mg.	Intrav.	K. 122 „	Slight G.T.
1328	30·0 mg.	Subcut.	K. 122 „	Local T. and caseous nodules in lungs.
1327	10·0 mg.	Subcut.	K. 122 „	Local T. and a single nodule in the lung.

VIRUS Z IV (Rhesus Monkey).

Original material—The tuberculous material was obtained from an adult Macacus Rhesus which had been specially caught in the Indian jungle for the Royal Commission on Tuberculosis. On arrival it was noticed to have a cough and was therefore killed on January 26, 1906.

Post-mortem Examination. — The lungs showed apical and marginal emphysema and were marked on the surface by numerous scars. The lung substance was filled with hard irregular nodules; these on section were caseous and many of them were softened in the centre, forming cavities filled with caseo-pus. In the right lung there was a large air-containing cavity with fibrous walls lined by caseo-pus. Each of two bronchial glands contained a caseous nodule. In the spleen there was a caseous nodule and one in the left kidney. The liver showed sparsely scattered miliary tubercles. In smear preparations from the spleen, lung and bronchial gland, long beaded tubercle bacilli were found.

CULTURES.

A culture was isolated from the lung, and this grew luxuriantly on the differential media, forming on glycerin agar and glycerinated potato rich yellow wrinkled and warty layers.

INOCULATION EXPERIMENTS.

(*a*) With original material from Rhesus Monkey.

No inoculation experiments were performed with the original material.

(*b*) With culture from this material.

Rabbits.—Rabbit 1326 was inoculated *intravenously* with 10 mg. of culture and died in 22 days of general tuberculosis. The lungs did not collapse normally, and were closely filled with grey tubercles with yellow centres. Mediastinal glands partly caseous. Moderately numerous grey tubercles were visible in the cortices of the kidneys. No foci could be seen in the spleen or liver.

Rabbit 1325 received 1·0 mg. *intravenously* and when killed after 122 days had gained in weight and showed slight general tuberculosis. The lungs were crepitant, and on the surfaces beneath the pleura were minute translucent tubercles with opaque centres. The surfaces of the kidneys were pitted and showed discrete translucent nodules from which soft caseous streaks passed through the pyramids; the pelvis of the right contained a little caseo-pus. In the tissue beneath each nipple there was soft yellow caseous substance which microscopically showed moderately numerous tubercle bacilli. No disease elsewhere.

Rabbits 1327 and 1328 were inoculated *subcutaneously*, the former with 10 mg. the latter with 30 mg., and were killed after 122 days. Rabbit 1327 showed a cystic local lesion, a soft caseous nodule in an axillary gland and a single encapsuled caseous miliary tubercle in the right lung. Rabbit 1328 had a larger caseo-purulent local cyst, but the axillary glands were normal. The lungs contained, mainly on the surface beneath the pleura, moderately numerous irregular flat translucent nodules caseating in the centre; the nodules were confluent at the anterior and posterior extremities and there were caseating marginal nodules. With the exception of a soft caseous nodule in a bronchial gland there was no tuberculosis elsewhere.

Guinea-pigs. — Guinea-pig 2468 died of general tuberculosis in 25 days after the *intraperitoneal* inoculation of 1·0 mg. Guinea-pig 2467 was inoculated *subcutaneously* with 1·0 mg. and died in 108 days; the tuberculosis was of the chronic type and the lymphatic glands were but little enlarged and showed only slight caseation, except for those nearest to the local lesion.

I.

VIRUS Z V (Chimpanzee).

CULTURE INOCULATIONS.

MESENTERIC GLAND.

May 4, 1907.

Inoculated with culture derived from the original material.

The culture used was the 10th generation, 23 days old, and had been in cultivation a total period of 341 days.

GUINEA-PIGS.

Number.	Dose.	Method of Inoculation.	Duration of Life.	Result.
2466	1·0 mg.	Intrap.	D. 22 days	G. T.
2465	1·0 mg.	Subcut.	D. 111 „	Chronic G. T.

RABBITS.

Number.	Dose.	Method of Inoculation.	Duration of Life.	Result.
1322	10·0 mg.	Intrav.	D. 19 days	Acute T.
1321	1·0 mg.	Intrav.	K. 122 „	Chronic G. T.
1324	30·0 mg.	Subcut.	K. 122 „	Local T. 4 caseous nodules in the lungs.
1323	10·0 mg.	Subcut.	K. 122 „	Local T. only.

II.

FOWLS.

September 24, 1908.

Inoculated with culture derived from the original material.

The culture used was the 4th generation, 14 days old, and had been in cultivation a total period of 850 days.

Number.	Dose.	Method of Inoculation.	Duration of Life.	Result.
480	10·0 mg.	Intrav.	K. 77 days	Few tubercles in lungs.
482	10·0 mg.	Intrav.	K. 46 „	Minute tubercles in lungs.
478	100·0 mg.	Intramusc.	K. 84 „	Local T. Tubercle in liver.

Inoculated with an emulsion from the lung of Fowl 482.

November 10, 1908.

Animal.	Method of Inoculation.	Duration of Life.	Result.
Rabbit 1918	Intrav.	K. 58 days	2 caseous nodules in lungs.
Guinea-pig 3347	Subcut.	K. 41 „	Early G. T.

VIRUS Z V (Chimpanzee).

Original material—This chimpanzee was acquired for experimental purposes, and died at the isolation station.

The post-mortem examination was made on May 28, 1906, and revealed acute miliary tuberculosis, the lungs and kidneys being closely filled with grey tubercles. In the small intestine there were four ulcers with thickened bases and serpiginous outlines; in the large intestine there was one. The mesenteric glands were adherent to each other; they were enlarged and to a great extent replaced by softening caseous substance.

CULTURE.

A culture was isolated directly from a mesenteric gland. On the various differential media the culture produced characteristic luxuriant pigmented growths, resembling in this respect a human tubercle bacillus of Group II.

INOCULATION EXPERIMENTS.

(*a*) With the original material from Chimpanzee.

Guinea-pigs. — Two guinea-pigs were inoculated intraperitoneally, Guinea-pig 2050 with an emulsion of the lung, and Guinea-pig 2051 with an emulsion of the mesenteric gland. Guinea-pig 2050 died in nine days of a subacute non-tuberculous infection. Guinea-pig 2051 died in 26 days of general tuberculosis.

(*b*) With culture from mesenteric gland of Chimpanzee.

Rabbits.—Rabbit 1322 was inoculated *intravenously* with 10 mg., and died in 19 days. The lungs did not collapse normally, and were closely filled with minute grey translucent tubercles. Numerous grey foci were visible in the cortices of the kidneys. None could be seen in the spleen or the liver. Tubercle bacilli were sparse in smear preparations made from the spleen, liver, lung, and kidneys.

Rabbit 1321 was killed 122 days after the *intravenous* inoculation of 1·0 mg.; in the lungs there were two minute transparent tubercles with opaque centres. The kidneys contained in the cortices a few caseous nodules; in the medulla of each kidney there were about fifteen yellow caseous miliary tubercles, a few gritty. The right elbow joint and the fifth, sixth, and seventh costo-vertebral articulations contained soft caseous substance. No tuberculosis elsewhere.

Two rabbits were inoculated *subcutaneously* and were killed in good health 122 days later.

Rabbit 1323 received 10 mg. and showed only a soft caseous nodule in the skin, over which was a small ulcer. Rabbit 1324, inoculated with 30 mg., developed a cystic local lesion and four caseating nodules in the lungs up to about a hemp seed in size.

Guinea-pigs. — Two guinea-pigs were inoculated No. 2466 *intraperitoneally* with 1·0 mg. and No. 2465 *subcutaneously* with 1·0 mg.

Guinea-pig 2466 died in 22 days with general tuberculosis.

Guinea-pig 2465 succumbed to chronic general tuberculosis 111 days after inoculation; the spleen was enlarged and contained scattered calcareous granules. The right kidney contained a grey nodule in the cortex extending through the medulla to the pelvis where its apex was yellow and soft. The liver, not enlarged, contained a network of grey foci. In the lungs there were numerous discrete tubercles, the majority perfectly translucent. The bronchial, lumbar, iliac and portal glands contained calcareous granules easily picked out.

Fowls.—Fowls 480 and 482 were each inoculated *intravenously* with 10 mg. of culture. Fowl 480 was killed after 77 days, and Fowl 482 after 46 days; both showed a few minute tubercles in the lungs, and no disease elsewhere. Fowl 478, inoculated *intramuscularly* with 100 mg., was killed 84 days later, and showed local tuberculosis only.

VIRUS Z VI (Cat).

CULTURE INOCULATIONS.

MESENTERIC GLAND.

I.—September 10, 1907.

Inoculated with the culture derived from the original material.

The culture used was the 5th generation, 21 days old, and had been in cultivation a total period of 105 days.

GUINEA-PIGS.

Number.	Dose.	Method of Inoculation.	Duration of Life.	Result.
2614	0·1 mg.	Intrap.	D. 20 days	G. T.
2613	0·1 mg.	Subcut.	D. 60 „	G. T.

RABBITS.

Number.	Dose.	Method of Inoculation.	Duration of Life.	Result.
1456	1·0 mg.	Intrav.	D. 17 days	G. T.
1452	0·1 mg.	Intrav.	D. 19 „	G. T.
1453	0·1 mg.	Intrav.	D. 20 „	G. T.
1455	10·0 mg.	Subcut.	Killed (ill) 71 days.	G. T.
1454	1·0 mg.	Subcut.	D. 44 days	G. T.

VIRUS Z VI (Cat)—*continued.*

II.

INOCULATIONS WITH EMULSION OF ORIGINAL MATERIAL.

MESENTERIC GLAND.

MAY 29, 1907.

Number.	Method of Inoculation.	Duration of Life.	Result.
Rabbit 1356	Intrap.	D. 40 days	G. T.
Rabbit 1355	Subcut.	K. 58 „	Early G. T.
Guinea-pig 2507	Subcut.	D. 60 „	G. T.
Guinea-pig 2508	Intrap.	D. 98 „	G. T.

Emulsion of Lung of Rabbit 1355.

JULY 26, 1907.

Number.	Method of Inoculation	Duration of Life.	Result.
Fowl 290	Intrap.	K. 129 days	Slight peritoneal tuberculosis.
Fowl 292	Intramuscular.	K. 129 „	Local tuberculosis only.

VIRUS Z VI (Cat).

Original material—The specimen received was the enlarged mesenteric gland from a case of casual tuberculosis in a cat sent by Sir John McFadyean, May 28, 1907. The gland measured 4·6 by 3·5 by 2·5 cm. On section it was found to consist of three parts fused together, and was entirely composed of yellow caseous substance softening in parts. Smear preparations showed very numerous tubercle bacilli.

CULTURE.

A culture was isolated direct from the mesenteric gland. Its characters were those of a bovine tubercle bacillus belonging to Class II. On glycerin serum it produced a moderately thick creamy layer, the surface of which was ribbed ; on glycerin-agar after ten weeks there was a thin grey translucent layer, which did not increase subsequently ; the final growth on glycerinated potato consisted of numerous minute white raised colonies. On glycerin gelatin in ten weeks the surface was three-quarters covered by a thin transparent pellicle dotted over with greyish white foci.

INOCULATION EXPERIMENTS.

(*a*) With the original material from the Cat.

Rabbits.—Rabbit 1356 was inoculated intraperitoneally with an emulsion of the mesenteric gland, and died in 40 days of general tuberculosis. The peritoneum and mesentery were studded with caseous nodules and the omentum was thickened. The spleen and kidneys contained moderately numerous tubercles and the lungs were closely filled with caseous tubercles. Rabbit 1355, inoculated subcutaneously, was killed after 58 days, and showed early general tuberculosis ; the lungs contained numerous discrete caseating nodules.

Guinea-pigs.—Two guinea-pigs were inoculated, one *intraperitoneally*, the other *subcutaneously*. Both died of general tuberculosis in 98 and 60 days respectively.

Fowls. — Two fowls, Nos. 290 and 292, were inoculated, the former *intraperitoneally*, the latter *intramuscularly*, with an emulsion made from the lung of Rabbit 1355 (See above).

Fowl 290, killed 129 days later, showed slight peritoneal tuberculosis only. Fowl 292 also killed after 129 days, was healthy except for slight tuberculosis at the seat of inoculation.

(*b*) With culture from Cat's mesenteric gland.

Rabbits.—Three rabbits 1456, 1452, and 1453, were inoculated *intravenously*, and died of general tuberculosis. Rabbit 1456 received 1·0 mg. and died in 17 days. Rabbits 1452 and 1453 received 0·1 mg., and died in 19 and 20 days respectively. Two rabbits were inoculated *subcutaneously*, No. 1454 with 1·0 mg. and No. 1455 with 10 mg. ; the former died of general tuberculosis after 44 days, the latter after 71 days.

Guinea-pigs.—Guinea-pig 2614 died in 20 days after the *intraperitoneal* inoculation of 0·1 mg., and Guinea-pig 2613 in 60 days after the *subcutaneous* inoculation of 0·1 mg., both of general tuberculosis.

INVESTIGATION OF AVIAN TUBERCLE BACILLI OBTAINED FROM BIRDS AND SWINE.

BY

F. GRIFFITH, M.B.

INVESTIGATION OF AVIAN TUBERCLE BACILLI OBTAINED FROM BIRDS AND SWINE.

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INTRODUCTION.

The existence of well marked differences is generally recognised between the tubercle bacilli mainly responsible for the production of avian and mammalian tuberculosis respectively. The bacillus constantly found in the tuberculosis occurring naturally in fowls and pigeons has a well defined group of characters and properties, and has been designated the avian tubercle bacillus.

The original material used in this investigation has been obtained from nine avian sources—three fowls, three pheasants, a pigeon, a demoiselle crane, and a Senegal touracou. In addition there are included in this report the experiments made with cultures from five porcine viruses, which proved to be identical in characters and virulence with the avian tubercle bacilli obtained from birds. The details concerning the pigs from which the avian tubercle bacilli were derived are given in the Report on Swine Tuberculosis. (*See* Vol. III. of the Appendix.)

Each of the cultures has been tested as to its virulence for fowls, rabbits, and guinea-pigs, the majority also for calves, and some for pigs, monkeys, dogs, and other species of animals.

The experiments with mammalian tubercle bacilli of bovine, porcine, and equine origin on fowls, parrots, and mice are given for the purpose of comparison.

This part of the report on avian tubercle bacilli is devoted to the consideration of the cultural characters of the fourteen viruses above referred to and of their power of setting up tuberculosis in different species of animals. The question as to their capability of undergoing modification is dealt with in a special report. From many of the animals used for experiment cultures have been recovered for the double purpose of ascertaining whether or not the lesions were produced by the bacilli inoculated and whether the cultures had undergone any change by residence in the animal body. It has happened in a certain number of cases that bacilli differing from those introduced have been isolated. To the animals in which this has occurred attention is directed by an asterisk and a foot-note at the bottom of the page, and full consideration is given to them in that part of the report dealing with modification experiments.

The inoculation experiments with the avian cultures from swine and from birds are given under separate headings, although the results have shown the cultures to be identical.

The usual method has been adopted in presenting the results. In the general results short abstracts are given of the investigation of the cultural characters of the avian tubercle bacillus and of the effects of the various forms of inoculation on different species of animals. These are followed by tabular summaries in which the above subjects are dealt with in greater detail. Finally there are the full accounts of the post-mortem examinations of the larger animals preceded, in the case of each virus by descriptive tables which show in a graphic form the number and variety of animals inoculated with that particular virus.

GENERAL RESULTS.

The fourteen cultures of avian tubercle bacilli used in this investigation have been derived from various sources, both avian and mammalian, but no constant or important differences have been observed either in their cultural characters or in their pathogenic properties.

Culture. In culture, on artificial media, the avian tubercle bacillus forms a slimy, whitish or yellowish-white growth, easily emulsified and growing most luxuriantly on media containing glycerin. It forms a marked contrast to the dry, scaly, or warty growth usually produced on such media by mammalian tubercle bacilli which can only be emulsified partially and with difficulty. The differences between the two types of bacilli are not always apparent on egg and serum media.

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† "Modification Experiments with tubercle bacilli derived from animals other than man." Page 383 of this volume.

Effects on Animals.

The general result of the inoculation experiments has been to show that various species of animals differ in susceptibility to the action of the avian tubercle bacillus.

For fowls and parrots the avian tubercle bacillus is virulent, and progressive tuberculosis has been caused in them whether the inoculation has been made intravenously, intraperitoneally, subcutaneously, or by feeding.

Fowl.

The lesions produced in fowls by intravenous inoculation vary generally with the duration of life of the fowl and with the dose used. Comparatively large doses, from 0·1 milligramme to 50 milligrammes, usually cause death after about five or six weeks from multiplication of tubercle bacilli in the tissues without the formation of visible tubercles. If the fowl lives for about eight weeks or longer the post-mortem examination reveals the following condition. The spleen and liver are the organs most severely affected ; they are enlarged and contain caseous tubercles with thin grey capsules. There are usually discrete caseo-necrotic nodules in the lungs and in the bone-marrow of the ribs ; the kidneys show no tubercles.

After the intraperitoneal inoculation of moderately large doses equivalent to those given intravenously, the disease runs a less acute course, and the disseminated tuberculosis approaches in type that following a subcutaneous inoculation ; the peritoneal lesions are usually severe.

Subcutaneous as well as intramuscular inoculations of fowls have caused general tuberculosis in every instance, even after so small a dose as the ten-millionth part of one milligramme of culture. The picture of the disease following a dose of ten milligrammes, which invariably produces a fatal result, is as follows :—There is great emaciation and anaemia. A yellow caseo-necrotic tumour forms at the seat of the inoculation, and there is usually a small ulcer in the skin at the site of entry of the needle. The spleen and liver are enlarged and filled with nodules composed of yellow caseous substance surrounded by thin grey capsules. In the lungs there are similar nodules but much more sparsely distributed, and the kidneys are rarely affected. There may be enlargement and caseation of the cervical glands and tubercles in the muscles, intestinal walls, and bones.

Feeding with cultures of avian tubercle bacilli or with tuberculous tissues containing avian tubercle bacilli causes tuberculosis in fowls with certainty, and the generalised disease has the same incidence as in the case of subcutaneous and intramuscular inoculations. A series of fowls was fed with equivalent doses of emulsified organs containing avian tubercle bacilli, and the individual animals were killed at successive intervals of about four weeks. In this manner the progress of the alimentary disease could be traced from the initial formation of necrotic foci in the Peyer's patches and tubercles in the mucous membrane of the intestines to the final production of large caseous nodules hollowed out internally and projecting as rounded tumours on the peritoneal surface of the intestine.

Fowls tested for comparative purposes with mammalian tubercle bacilli (respectively derived from the ox, pig, horse, antelope, and chimpanzee) have shown themselves resistant when inoculated intraperitoneally, subcutaneously, and by feeding, but frequently succumb to the effects of the bacilli universally distributed about the body after the intravenous inoculation of moderately large doses. In a fatal case the body is extremely emaciated and bloodless ; the liver is enlarged, pale, and soft, and beset with irregular yellowish grey necrotic foci ; the spleen is swollen, and the lungs are congested and oedematous. The kidneys are pale. In addition, the lungs may contain typical encapsuled caseous nodules, and these may be present whether the animal has survived the effects of the inoculation or not. But such tubercles are never seen in the liver and spleen, which are the organs most severely affected after the inoculation of avian tubercle bacilli. Tubercle bacilli killed by exposure to steam at 100° C., whether avian or mammalian, may produce in fowls similar effects to living mammalian tubercle bacilli, and it would appear therefore that these effects can be attributed to the toxic action of the tubercle bacilli, and are not a true tuberculosis.

Parrot.

In the experiments on parrots the avian tubercle bacillus has set up lesions which do not differ macroscopically from those following the inoculation of avian tubercle bacilli in fowls. But in addition, parrots are susceptible to the action of the bovine tubercle bacillus which can produce in them progressive tuberculosis identical in its main features with that caused by the avian tubercle bacillus. The comparable experiments have not been numerous, but the results indicate that the bovine bacillus is more virulent for the parrot than the avian bacillus. The feeding experiments show that the parrot's intestine is not so susceptible to tuberculosis as the fowl's ; in only one parrot out of four was there any affection of the intestine, and then only to a very slight extent.

The rabbit and the mouse are the only two mammals in which true progressive tuberculosis is produced by the avian tubercle bacillus.

Rabbit.

In rabbits after intravenous inoculation of moderately large doses (from 1 mg. to 10 mgs.) there is great multiplication of tubercle bacilli in the organs, and the course of the disease is rapid. In the most acute cases no changes are visible beyond general pallor, slight oedema of the lungs and a little enlargement of the spleen. But if life has been prolonged to about four or five weeks there is pronounced tissue reaction. The spleen often becomes enormously enlarged and mottled with greyish-white foci collected into nodules. Grey foci may be seen in the liver, and a few minute tubercles in the lungs which however remain soft and crepitant.

Similar results are obtained after the intraperitoneal inoculation of large doses, but this method is not so certain in its effects as the intravenous ; there is greater tendency for the disease to become chronic.

A chronic form of disease, which has a characteristic distribution, follows the inoculation of small doses intravenously and intraperitoneally, and is almost invariable after infection by subcutaneous inoculation and by feeding. After a subcutaneous inoculation the lungs and kidneys are rarely severely affected, and the liver and spleen are often quite free from lesions. The sites of election of the tuberculous lesions are the joints, testes, and areolar tissues of various regions.

In the feeding experiments on rabbits the disseminated disease was similar in type to that obtained by subcutaneous inoculation. The intestinal lesions varied in individual cases, but there was some affection of the intestines in more than half the total number. In some of the animals there were a few caseous foci in the Peyer's patches, in others the intestines were studded with caseous nodules which were hollowed out and ulcerated internally, and which projected on the peritoneal surface of the gut as rounded tumours more or less constricted at their points of attachment. In the lymphoid tissue of the blind end of the caecum, and at the junction of the ileum with the caecum there is often a great multiplication of tubercle bacilli which results in the deposit of a soft opaque yellowish substance. This substance is at first in small discrete patches, but these may ultimately run together and form a complete layer of some thickness.

The avian tubercle bacillus is definitely less virulent for the rabbit by every form of inoculation than the bovine tubercle bacillus, and when given in a very small dose may fail to produce any disease. This occurred in one case, Rabbit 1348, when a dose of culture representing the ten millionth part of one milligramme was inoculated subcutaneously into a rabbit and produced no infection, though an equivalent dose of the same culture emulsion caused tuberculosis in a fowl.

Mouse.

In the mouse general tuberculosis has been produced by subcutaneous and intraperitoneal inoculations, and by feeding, with avian tubercle bacilli. There are formed in the organs, nodules of a greyish semi-transparent appearance which contain very numerous tubercle bacilli. The lungs are often replaced and rendered quite solid by this tuberculous tissue. Mice appear to differ in individual susceptibility to avian tubercle bacilli, and sometimes recover after the inoculation of a dose of culture which at another time produces a fatal result.

Calf, Pig, &c.

The calf, pig, horse, monkey, cat, and guinea-pig react to avian tubercle bacilli in an almost identical manner. After subcutaneous inoculations and feeding, even with very large doses, they have never developed progressive tuberculosis, and have rarely shown more than disease localised to the seat of inoculation and the nearest lymphatic glands. After intravenous inoculations (intraperitoneal in the case of the guinea-pig) with moderately large doses, they succumb almost invariably to the toxic effects of the bacilli multiplying in their tissues. In the case of three pigs inoculated intraperitoneally, subcutaneously, and by feeding respectively with culture of the same virus, there was dissemination and great multiplication of tubercle bacilli in the organs, and though the animals had not apparently suffered in general health up to the time when they were killed, they nevertheless did not increase in weight at the usual rate. With regard to the ultimate fate of the disseminated bacilli, it may be mentioned that a pig fed at the same time and with a dose of the same culture as the three mentioned above was allowed to live for 315 days, and showed at the post-mortem examination only a few chronic lesions and no tubercle bacilli in the organs. When avian tubercle bacilli are distributed throughout the body of the pig by direct inoculation into the blood stream they multiply in the tissues and cause emaciation and death of the animal.

Goat.

The goat is as a rule affected similarly to the latter group of animals ; that is, it resists subcutaneous inoculations and feeding, but succumbs to the effects of the intravenous inoculation of avian tubercle bacilli.

An exceptional result was obtained after the subcutaneous inoculation, with 50 milligrammes of culture of Virus A. X., of a young goat, No. 48, which was killed when ill after 83 days. The lungs contained scattered typical tubercles and there were necrotic foci in the liver, in both of which organs tubercle bacilli were demonstrated. The mucous membrane of the intestines was swarming with tubercle bacilli and the mesenteric glands were caseo-necrotic. This latter condition was no doubt responsible for the animal's weak and emaciated condition.

It appeared from this instance that the young of the goat was more susceptible than the adult to the action of avian tubercle bacilli, and in order to test this conclusion two very young animals were fed with moderately large doses. Each of the two kids received, when five days old, 60 milligrammes of culture given in milk through an artificial teat. They were killed in good general health after eight weeks and had gained in weight. The post-mortem examinations showed no disseminated tuberculosis, and no tubercle bacilli could be demonstrated in the organs. Locally, however, the tubercle bacilli had exerted severe irritant effects : the Peyer's patches were extensively ulcerated, and the mesenteric and ileo-colic glands were enlarged and caseating.

Rat.

The rat reacts to avian tubercle bacilli in the same way as to mammalian tubercle bacilli. If a sufficiently large dose is inoculated into the peritoneal cavity, the bacilli multiply in the tissues and ultimately cause the animal's death. To subcutaneous inoculation and feeding the rat is quite insusceptible.

Chimpanzee.

The chimpanzee has shown itself capable of resisting completely a dose of 50 milligrammes of culture introduced beneath the skin.

Dog.

The dog is able to withstand large doses of avian tubercle bacilli, inoculated intravenously, without suffering any ill effects or developing any tuberculous lesions.

VIRUSES OF AVIAN ORIGIN.

Designation of Virus.	Source.	Date of Receipt of Virus.	Description of Animals and Lesions.	Tissue used for Experiment.	Animals Inoculated.	Classification of Virus according to Cultural Characters and Virulence.
A. I.	Zoological Gardens.	February 15, 1906	The material was taken by Dr. Seligmann from a Senegal Touracon (Touracus Persa). The specimens sent were the lung and intestines. The intestines showed on the external surface numerous firm prominent yellow nodules ranging in size up to a thrush's egg; some of the larger were lobulated and almost encircled the gut which lay in a deep groove. The nodules consisted of friable yellowish necrotic material. On the mesentery there was a lobulated yellow mass composed of similar tissue. The lungs contained several large yellow nodules similar to those on the intestine.	Intestinal nodule.	1 Calf, 4 Monkeys, Fowls, Rabbits, Guinea-pigs, and Rats.	Avian.
A. II.	Zoological Gardens.	March 13, 1906	The material was taken by Dr. Seligmann from a Triangular-spotted Pigeon. The specimen sent was the spleen. It was composed throughout of dirty yellow friable caseo-necrotic material, for the most part firm, but in parts beginning to soften and break down. There was nothing in the mass to indicate that a spleen was being dealt with.	Spleen.	1 Chimpanzee, 1 Calf, 1 Goat, Fowls, Rabbits, Guinea-pigs, and Rats.	Avian.
A. III.	Zoological Gardens.	March 28, 1906	The material was taken by Dr. Seligmann from a Demoiselle Crane (anthropoides virgo). The specimens sent were the spleen and portions of liver and lung. The spleen was closely beset with yellow caseous tubercles up to a wheat grain in size. The piece of liver contained numerous large and very hard nodules up to 2 c.m. in diameter. On section they had a yellow waxy appearance, and showed a number of concentric rings of slightly darker colour, and closely resembled some forms of urinary calculi. Besides the larger nodules were numerous discrete yellow tubercles. The piece of lung contained one large irregular mass the size of a pigeon's egg, and two smaller masses; on section they resembled those in the liver. Numerous tubercle bacilli were found in a smear made from one of the lung nodules.	Lung.	1 Calf, 1 Goat, 1 Cat, Fowls, Rabbits, Guinea-pigs, and Rats.	Avian.
A IV.	Winchester.	April 6, 1906	A living pheasant. Killed at the Farm. Beneath the skin near the knee was a pea-sized dry yellow cheesy nodule. In a similar situation near the hip joint was a smaller nodule. One small grey nodule with soft yellow centre was seen in the lung. The liver was beset with numerous nodules up to a pea in size; the larger were soft and yellow with a delicate grey capsule, the smaller were quite grey. The spleen tissue was almost entirely replaced by a large firm dry yellow mass, leaving a narrow zone of splenic tissue in which were discrete grey nodules with yellowish centres. The kidneys were normal.	Liver.	Calves, Fowls, Rabbits, and Guinea-pigs.	Avian.

			In the ovary were numerous small eggs mixed up with yellow tuberculous nodules. On the mesentery were numerous grey tubercles, and there were two large nodules on the external surface of the intestine. These were found to be saccular dilatations of the intestine containing firm yellow necrotic masses and fœcal matter. In the first part of the intestine were numerous yellowish tubercles, and three small ulcers with necrotic centres were seen near one of the large nodules. All the lymphatic glands seen were normal. Numerous tubercle bacilli were found in the subcutaneous nodule, the liver and the spleen.			
A. V.	Winchester	April 7, 1906	A living pheasant. Killed at the Farm. The joint in the right wing corresponding to the wrist was expanded to the size of a pheasant's egg, and there were several ulcers in the skin over it. The lesion was composed mainly of a friable greyish yellow pulp. In the intestine 12 5 cm. from the gizzard was a group of caseous nodules projecting on both surfaces and ulcerated on the mucous surface Elsewhere in the intestine were six smaller ulcerated nodules and tubercles, and also a number of flat greyish patches. On the mesentery were numerous discrete pearly tubercles. The liver was closely beset with nodules up to 5 mm., greyish in colour, the larger yellowish in the centre. The spleen, the size of a partridge's egg, was almost entirely composed of waxy greyish-white friable nodules. The lungs were normal. All other organs and glands appeared normal.	Spleen.	Calf, Rabbits, and Guinea-pigs.	Avian.
A. VI.	Zoological Gardens.	April 10, 1906	The specimen sent was the body of a pheasant. Two small left cervical glands showed irregular yellow foci. The small intestine showed one circular ulcer with a caseous base. The spleen was much enlarged and almost entirely composed of large firm nodules with caseous centres and grey margins. The liver consisted almost entirely of translucent tissue with scattered opaque patches and foci. The kidneys were normal. In the right lung was one irregular caseating mass, and a single caseating nodule; in the left lung were a few miliary tubercles. Numerous tubercle bacilli were seen in a smear from one of the cervical glands, and fairly numerous tubercle bacilli in the spleen.	Spleen.	Fowls, Parrots, Rabbits, and Guinea-pigs.	Avian.
A. VII.	Winchester	November 20, 1906	The specimen sent was the body of a fowl, in fair condition. The pharynx was normal. In the wall of the caecum were two nodules, and in the rectum one miliary nodule. The spleen was enlarged and closely filled with irregular caseo-necrotic nodules. In the liver were scattered firm yellow nodules, easily shelling out of the substance; in addition the liver was peppered with opaque yellowish tubercles. In the lung was one caseous nodule and a miliary tubercle. In the marrow of the sternum one or two translucent tubercles were seen. Tubercle bacilli were moderately numerous in the nodules from the rectum and the lung, and in the bone marrow; they were numerous in the spleen, scanty in the liver.	Spleen	4 Pigs, 1 Cat, Fowls, Rabbits, Guinea-pigs, and Rats.	Avian.

VIRUSES OF AVIAN ORIGIN—*continued.*

Designation Virus.	Source.	Date of Receipt of Virus.	Description of Animals and Lesions.	Tissue used for Experiment.	Animals Inoculated.	Classification of Virus according to Cultural Characters and Virulence.
A. VIII.	Winchester	November 23, 1906	The specimen sent was the body of a fowl. A cervical lymphatic gland contained a small caseous nodule. In the duodenum was a large caseous ulcerated nodule. Lower down the intestine and in the caeca were several similar nodules, large and small, up to the size of a thrush's egg. The spleen was enlarged and on section contained numerous tubercles, translucent with yellow caseous centres. The liver was closely filled with nodules, ranging from a mere point to 1 cm. in diameter, similar to those in the spleen. In one kidney was a single minute grey focus. In each lung was a single pea-sized caseous nodule, and several grey tubercles. Numerous tubercle bacilli were found in the spleen and liver.	Spleen and Liver.	Calves, 2 Dogs, Fowls, Rabbits, Guinea-pigs, and Rats.	Avian.
A. IX.	Royal Veterinary College.	January 20, 1907	The specimen received was a portion of the liver of a fowl. Both on the surface and in the substance of the liver were numerous discrete tubercles up to a rape seed in size. Those which were large enough to cut consisted of yellowish fatty friable substance in a grey translucent capsule. Three smears were made, in one of which a mass of tubercle bacilli were found; none was seen in the others.	—	2 Rabbits, 1 Guinea-pig which died of acute infection.	No culture obtained.
A. X.	Royal Veterinary College.	January 29, 1907	The lung of a rabbit inoculated from a case of natural tuberculosis in a fowl was received from Sir John MacFadyean. The piece of lung showed a fine translucent network and a moderate number of discrete tubercles up to nearly a millet seed in size, with grey margins and caseous centres. A smear showed a moderate number of tubercle bacilli.	—	4 Calves, 3 Goats, 3 Pigs, 2 Dogs, Fowls, Rabbits, Guinea-pigs, and Rats.	Avian.

CULTURAL CHARACTERS OF THE AVIAN TUBERCLE BACILLUS.

This account of the cultural characters of avian tubercle bacilli has been compiled from observations made on the cultures of fourteen different avian viruses, of which nine were obtained from birds and five from swine, and on numerous strains of these viruses derived from various experimental animals. The outcome of the work has been to establish that there are no constant differences between the cultures in their characters on the various media and that all belong to the common type of avian tubercle bacillus.

The following is a description of the characteristic appearances of the growth occurring on each variety of medium, both in primary culture and in subculture :—

Primary Cultures.

The time at which there is first visible evidence of growth depends upon the number of living bacilli inoculated on to the medium. On favourable media, such as egg or glycerin serum, the colonies when numerous make their appearance at about the eighth or tenth day, but when they are sparse they may not be observed until the end of three weeks. This difference in rate of growth is probably more apparent than real on account of a large number of colonies being more readily noted than a few.

Egg.

This medium is very favourable for the growth of avian tubercle bacilli just as for mammalian tubercle bacilli. They are first visible either as minute glistening points or flat transparent colonies exactly resembling colonies of mammalian tubercle bacilli. When the colonies are numerous and closely cover the surface they may remain flat and translucent, but more commonly after about 14 to 21 days minute pearly white colonies make their appearance scattered over the surface ; these grow out from the transparent colonies, not all of which become opaque. They increase in size and number, becoming opaque, white, and finally creamy ; they may be rounded, irregular, characteristically umbilicated or crater-like. When the colonies on the egg are sparse they very often all become opaque, raised, and yellowish. These opaque colonies when examined microscopically differ morphologically from the transparent ones. The latter consist of very small brightly staining acid fast bacilli. In the former there is great variation, even in the colonies on the same tube and a marked feature is the number of blue staining forms. In addition to the ordinary acid fast bacilli there are met with forms resembling chains of streptococci staining either all red, all blue, or partly red and partly blue ; club-shaped bacilli are frequent, occurring singly or at the end of a streptococcal chain. Branched forms are found frequently, contained amongst the tangled masses of blue or red coccal chains which are difficult to dissociate. The opaque colonies and the transparent colonies when subcultivated on serum or glycerin serum produce the same type of growth which microscopically consists of short acid fast bacilli. Sometimes when an opaque colony is subcultivated on glycerin agar there is formed a mass of tangled acid fast threads, of which some are branched, and others are thick and club shaped.

Serum and Glycerin Serum.

On both these media avian tubercle bacilli are first visible as minute perfectly transparent droplets with an amber tint when viewed by transmitted light. The difference as regards the favourability of the two media quickly becomes evident. On serum the colonies remain small. On glycerin serum they are more numerous and larger ; they become greyish-white and finally opaque and yellowish, and when they are very numerous they coalesce and cover the surface with a thick moist yellowish layer.

Serum Agar and Glycerin Serum Agar.

Both these media are useful for obtaining primary cultures of avian tubercle bacilli and that containing glycerin is the more favourable. As the growth is quite transparent it is possible at once to distinguish between avian and mammalian tubercle bacilli. The contrast between the transparent amber-coloured droplets produced by the former and the flat delicate grey dry colonies of the latter is very striking.

Glycerin Agar and Glycerinated Potato.

Growth occurs often, though slowly, in primary culture on glycerinated potato, in the form of minute moist whitish colonies.

Glycerin agar, though so excellent a medium for the avian tubercle bacillus in subculture, is almost as unfavourable for it in primary culture as it is for the mammalian tubercle bacillus.

Subcultures.

Serum and Glycerin Serum.

The avian tubercle bacillus grows quite readily when subcultured on pure serum, but never produces a large amount of growth. It forms a thin shiny transparent layer which only rarely becomes thick or opaque.

On glycerin serum the appearance is at first the same as that on serum alone. Growth, however, continues, and the transparent layer becomes greyish white and slightly opaque ; finally, after several weeks, the surface of the medium is covered with a thick moist creamy or yellowish layer, upon which moist warty colonies sometimes grow out. The surface of the growth is sometimes smooth and even, at others streaky and irregular in thickness. No pellicle is seen on the condensation water, but usually there are small masses of growth at the bottom, and movement of the tube will cause the water to become turbid.

Glycerin Agar.

On glycerin agar the avian tubercle bacillus grows rather slowly, but growth continues for a long time and a large mass of culture ultimately results. The early growth is a thin shiny translucent layer, which gradually becomes thick, moist, and greyish white ; it may remain comparatively smooth and slimy, or the surface may become thrown into wrinkles and folds or studded with raised colonies. The formation of a wrinkled layer is quite common on a favourable agar, and the growth has a great resemblance to that produced by the common human tubercle bacillus. There is, however, shown by the avian tubercle bacillus the characteristic sliminess which may perhaps not be apparent by reflected light but can always be recognised by transmitted light, and which becomes evident at once when the growth is touched with a spatula. The colour of the growth is usually greyish-white or creamy, but often there is a formation of reddish pigment which is irregularly distributed ; the tops of the folds or nodules may be quite pink, and this colour gradually fades into the usually creamy tint around.

Glycerinated Potato.

The avian tubercle bacillus grows luxuriantly on glycerinated potato. It forms at first a thin moist greyish-white layer which thickens and becomes yellowish. Later numerous small colonies grow out of this layer until the whole surface is beset with them. Occasionally a warty layer is formed resembling in appearance that produced by the easy-growing human tubercle bacillus, except that it is moist and easily broken up with the spatula. More rarely the surface is thrown into smooth folds.

Glycerin Broth.

On glycerin broth the avian tubercle bacillus produces an abundant growth, though there is in the beginning a little difficulty in getting it to form a surface pellicle. The simplest method is to spread a little young culture from glycerin serum on the surface of solid gelatin in an ordinary flat medicine bottle ; this becomes in the incubator at 37° C. a liquid medium upon which the culture floats. The growth quickly spreads, and in a week the surface is covered with a very thin scarcely visible film, which it is important not to disturb. Subsequently the film thickens irregularly, parts becoming opaque greyish-white, others remaining translucent. Quite early, bacilli begin to fall to the bottom and go on growing to form flocculi while the intervening liquid remains clear. Usually, in a small bottle containing about 40 cc. of broth, the final growth is a moist greyish-white pellicle of unequal thickness and opaque in parts, with growth climbing up the sides. In a flask containing a larger quantity of broth, from 200 cc. to 500 cc., growth continues further and the whole pellicle becomes uniformly thick, opaque, yellowish in colour, and thrown into folds; it is moist and slimy in appearance, without any warty formation, and readily sinks. So good a growth is, however, rarely obtained from a first subculture on broth, and before inoculating a large flask it is advisable to pass the culture from bottle to bottle at intervals of a week. Subcultures are better made early from a broth culture, when it consists merely of a thin film, since if the growth is of any thickness the pellicle inoculated is liable to sink or not to begin to grow.

COMPARISON BETWEEN THE CULTURAL CHARACTERS OF AVIAN AND MAMMALIAN TUBERCLE BACILLI.

The most characteristic point of difference between the two types of bacilli is that the cultures of avian bacilli are moist and easily emulsified, while on most media the mammalian cultures are dry and can only be broken up with difficulty.

It is possible to differentiate between the two types from cultural characters alone, but it is necessary, in order to avoid error, that a sufficient variety of media should be used. In primary cultures on clear serum or serum agar the transparent colonies of avian tubercle bacilli are easily recognised. But in subculture on serum the thin shiny layer formed by the avian bacillus may become dry on the surface and may resemble a poorly-growing bovine culture. On the other hand, the bovine tubercle bacillus, when subcultivated from egg on to serum, frequently produces a shiny transparent layer, and it may be a week or more before the surface assumes the usual dry glazed appearance.

On glycerin agar and glycerinated potato the avian tubercle bacillus frequently forms a wrinkled or warty growth, which almost exactly resembles a culture of the easy-growing human tubercle bacillus, but the characteristic difference is evident when the growth is touched with the spatula.

The colonies of avian tubercle bacilli on egg are frequently umbilicated or crater-like, but often no difference can be detected between avian and mammalian tubercle bacilli on this medium.

VITALITY OF TUBERCLE BACILLI ON VARIOUS CULTURE MEDIA.

Since it has been the rule to preserve for future reference primary cultures on egg media and subcultures on various media, a large number of tubes had been accumulated, and it was thought that use might be made of them in order to test the vitality of cultures kept for prolonged periods without being transplanted. The tubes had been plugged with wool and sealed with paraffin, and though there was no excess of moisture the medium was not dried up. All but a few of the tubes were kept in the incubator at 37° C.; if the tubes are efficiently sealed they keep better in the incubator than outside, since in the cold the paraffin contracts and moulds may grow in around the plugs.

For the purpose of testing whether the culture was still alive, the surface of the medium was scraped and about equal parts of the growth were used to inoculate a serum tube and an egg tube in each case; of the two media the egg gave the more successful results. The results are given below in the form of a table, and they show that cultures will maintain their vitality for long periods, whether kept in the incubator or at room temperature. Primary cultures remain alive for longer periods than subcultures; this is probably due to the fewer numbers of bacilli in primary cultures, whereas in subcultures there is a layer of growth which may be assumed to eat up more rapidly the essential part of the medium. The most advanced age at which a culture was able to grow was in the case of the avian 1,067 days, and the bovine 990 days, but no distinction could be drawn between the various types of bacilli tested.

TABLE SHOWING THE VITALITY OF CULTURES OF TUBERCLE BACILLI ON VARIOUS MEDIA.

Type of Bacillus.	Cultures Tested.	Total number of Strains.	Number from which growth occurred and age.		Number from which no growth occurred and age.	
Avian	Primary on egg	23	22	264–808 days	1	568 days
Avian	Primary on glycerin serum.	3	2	570 days	1	570 days
Avian	Primary glycerin serum agar.	3	3	317–715 days	0	—
Avian	Primary (kept out of incubator).	1	1	1,067 days	0	—
Avian	Subcultures	6	3	180–238 days	3	180–238 days
Bovine	Primary on egg	17	16	332–880 days	1	812 days
Bovine	Primary on glycerin serum.	3	3	733–990 days	0	—
Bovine	Primary glycerin serum agar.	3	3	737–785 days	0	—
Bovine	Primary (kept out of incubator).	4	4	374–847 days	0	—
Bovine	Subcultures	22	16	90–338 days	6	283–381 days
Bovine	Subcultures	20	11	90–209 days	9	183–381 days
Human (Group II.) ...	Primary on egg	6	5	454-751 days	1	829 days
Human (Group II.) ...	Primary on glycerin serum.	1	0	—	1	747 days
Human (Group II.) ...	Primary (kept out of incubator).	1	1	936 days	0	—
Human (Group II.) ...	Subcultures	5	2	90-380 days	3	90–380 days

Fowls.

SUMMARIES OF THE RESULTS OF THE INOCULATION AND FEEDING EXPERIMENTS WITH AVIAN TUBERCLE BACILLI, TOGETHER WITH A CONSIDERATION OF THE COMPARATIVE VIRULENCE, FOR CERTAIN SPECIES OF ANIMALS, OF AVIAN AND MAMMALIAN TUBERCLE BACILLI.

EXPERIMENTS ON FOWLS.

INOCULATION EXPERIMENTS WITH CULTURES OF AVIAN TUBERCLE BACILLI.

INTRAVENOUS INOCULATIONS (*Tabular summary*, pages 194–196).

Fowls, 21 in number, have been inoculated intravenously with cultures of avian tubercle bacilli, in doses varying from 50 mg. to 0·0000001 mg. This method of inoculation in fowls is severe and certain in its effects. All the doses from 50 mg. to 0·1 mg. caused fatal tuberculosis in periods varying from 29 to 42 days, with the exception of one fowl which died in 67 days after a dose of 10 mg. The average duration of life of seven fowls, each inoculated with 1·0 mg. of culture, was 33 days ; a fowl inoculated with 50 mg. died in 35 days, and two fowls, each inoculated with 10 mg., died in 29 and 37 days respectively. These results show that the dose of 1·0 mg. intravenously for a fowl is so severe that even after doses 10 and 50 times greater the duration of life is not further diminished. After 0·01 mg. three fowls died in from 45 to 54 days. The smaller doses set up a more chronic tuberculosis.

The lesions produced by the intravenous inoculation of avian tubercle bacilli in fowls vary generally according to the duration of life of the animal. Those animals which have died in from 29 to 42 days, after doses varying from 50 to 0·1 mg., have only occasionally shown definite tuberculous lesions visible to the naked eye. Usually there was emaciation together with general anaemia, the lungs were somewhat oedematous but quite crepitant, the spleen was enlarged, the liver was enlarged and pale, and the kidneys were apparently normal. Sometimes grey foci were visible in the spleen just beneath the capsule. Smear preparations made from the liver and spleen substance and bone marrow showed very numerous tubercle bacilli ; bacilli were less numerous in the lungs and only sparse in the kidneys.

The fowls, which died in 54 and 56 days respectively after 0·01 mg., showed the lungs congested and oedematous, and scattered yellowish miliary tubercles in one. The spleens were enlarged and closely filled with grey tubercles with opaque centres ; the livers were similar ; the kidneys were apparently normal. A fowl which died in 97 days after 0·001 mg. showed more advanced tuberculous changes. The lungs contained necrotic nodules up to a hemp seed in size. The spleen was enlarged and almost entirely necrotic, and there were numerous tubercles up to a millet seed in size in the liver which was much enlarged. The kidneys were normal. There were tubercles in the bone-marrow of the ribs.

The smallest doses, representing respectively the 100,000th, 1,000,000th, and 10,000,000th part of a dilution of 1·0 mg. of culture, all caused tuberculosis in fowls. They were killed after 94 days, and in each case the spleen and the liver contained caseo-necrotic nodules varying in number according to the dose, and in each case the lungs and kidneys were normal.

INTRAPERITONEAL INOCULATIONS (*Tabular summary*, pages 196–198).

The intraperitoneal inoculation of doses equivalent to those given intravenously has caused a less acute type of tuberculosis and the lesions have been more evident from the longer duration of life ; 14 fowls were inoculated.

After the doses of 10 mg. and 1·0 mg. the peritoneal tuberculosis was usually severe. The visceral and parietal peritoneum were covered either with closely placed caseating tubercles or with a fibrinous membrane beneath which were patches of yellow necrotic substance. The mesentery was thickened and enclosed layers of yellow necrotic substance and there were similar layers beneath the peritoneum over the gizzard. The disseminated tuberculosis resembled that following equivalent doses inoculated subcutaneously or intramuscularly.

Three fowls were inoculated with very small doses representing respectively the 10,000th, 100,000th, and the 10,000,000th part of 1·0 mg. of culture. The first two fowls when killed after 50 days were in good condition and each showed discrete tubercles on the peritoneal folds and caseating tubercles in the lungs, liver, and spleen. The last, which received the smallest dose, was perfectly healthy.

SUBCUTANEOUS INOCULATIONS (*Tabular summary*, pages 199–201).

Fowls, 17 in number, have been inoculated subcutaneously with doses varying from 100 mg. to 0·0000001 mg. In some cases the inoculations have been made into the breast muscle instead of into the subcutaneous tissues, but in both forms of inoculation the general result has been the same. The duration of life is apt to be irregular. The duration of life of seven fowls, inoculated each with 10 mg. of culture, ranged from 47 to 133 days, the average being 72 days. Two fowls, inoculated each with 1·0 mg., died in 79 and 108 days respectively. The dose of 10 mg. of culture is the most satisfactory ; but every dose varying from 100 mg. to 1·0 mg. has caused fatal tuberculosis except in one instance with the latter dose (Fowl 252, killed 254 days after inoculation, showed only moderately severe general tuberculosis). The distribution of the lesions is as follows :—The animal becomes very anaemic and extremely emaciated. At the seat of inoculation beneath the skin of the breast there is a flattened greasy yellow necrotic tumour occupying the concavity of the breast bone. The breast muscle usually is completely atrophied, and this is the result whether the inoculation has been made into the muscle itself or into the subcutaneous tissues over the muscle. In the skin at the point of entrance of the needle there is very often a small ulcer covered with a dry scab. The spleen is large and is closely filled with yellow necrotic nodules enclosed in thin grey capsules ; sometimes the splenic pulp is completely replaced. The liver is enlarged and the substance pale and fatty ; it contains numerous tubercles, usually smaller than and not so closely placed as those in the spleen. The tubercles consist of yellow friable necrotic substance enclosed in thin capsules of translucent tissue ; the central necrosis occurs very early and is present in almost the smallest tubercle visible. The lungs are usually affected but to a much less degree than either the liver or the spleen ; in the majority of cases they contain a few caseous nodules which easily shell out, leaving their grey capsules adherent to the lung parenchyma. The kidneys are rarely affected (in 3 out of 13 fowls) and then only show an occasional grey tubercle. The cervical glands on each side of the neck show caseation in about half the total number of cases. Occasionally a few tubercles are seen in the muscles, intestinal walls, and bones.

For the purpose of ascertaining how small a dose of culture would infect a fowl by the subcutaneous method of inoculation, five fowls were inoculated with culture of Virus A VIII. in doses estimated to contain from 1·0 mg. to 0·0000001 mg. In this series the dose was contained in a small amount of salt solution and was inoculated beneath the skin of the breast.

One fowl, inoculated with 0·0001 mg., died in 190 days of general tuberculosis. The rest were killed after 254 days.

The fowl inoculated with the smallest dose showed no local lesion; the spleen contained a moderate number of tubercles and the liver four; there was no tuberculosis elsewhere. The next dose, which was 1·0 cc. of a suspension containing 1·0 mg. of culture diluted a million times, gave rise to a flat yellow nodule on the breast muscle 4 mm. in diameter, fifteen nodules in the spleen, and scattered tubercles in the liver. There was caseation of a cervical gland and a few small nodules in the caecum just beneath the peritoneum, and the mucous membrane over them was intact. The other doses up to and including 1·0 mg. gave rise to general tuberculosis.

FEEDING EXPERIMENTS WITH CULTURES OF AVIAN TUBERCLE BACILLI AND WITH TUBERCULOUS TISSUES.

With Tuberculous Tissues (*Tabular summary*, pages 204–205).

Fowls. A series of five fowls was fed with equivalent doses of tuberculous material, which consisted of the organs of two rabbits; (the rabbits had been inoculated, one intravenously, the other intraperitoneally, with culture of Virus A VIII, and had died of acute tuberculosis after 22 days, the organs containing very numerous tubercle bacilli).

The organs of the rabbits were mixed up with a little meal, and this mixture was eaten with avidity by the fowls. The first fowl was killed at the end of 70 days, and the next three at intervals of 28 days; the fifth died after 173 days. The details of the post-mortem examinations of each fowl are given in the tabular summary (page 204). In all the five fowls there was generalised tuberculosis without special features; the caseous nodules were more numerous in the liver and spleen than in the lungs. Tubercles occur in the lungs more frequently after feeding than after subcutaneous inoculations, and still more often than after intravenous and intraperitoneal. The cervical glands of three fowls showed caseous nodules, and in three instances there were caseo-necrotic nodules in the heads of the bones and in the ribs.

The following description shows the progress of the lesions in the alimentary tract. After ten weeks the Peyer's patches and solitary follicles of the small intestine were prominent, but showed no opacities; in smear preparations made from them there were moderately numerous tubercle bacilli.

After 14 weeks there were moderately numerous caseating tubercles in the mouth, pharynx, and oesophagus. The Peyer's patches were firm, grey, and beset with necrotic foci; they were slightly concave internally, and projected a little on the peritoneal surface. Beneath the mucous membrane of the small intestine there were scattered caseous nodules up to 1·5 mm. There were caseous foci in the glandular tissue of the proventriculus, and caseous nodules in the caeca and large intestine.

After 18 weeks there was more extensive disease of the Peyer's patches, which were composed of firm translucent tissue infiltrated with yellow necrotic substance; they were ulcerated and hollowed out internally, while on the peritoneal surface they formed prominent projecting nodules, the largest of which measured 2·2 by 1·5 by ·7 cm. There were in the mucous membrane of the small and large intestines and in the caeca numerous grey nodules with necrotic centres. In this fowl there was only slight tuberculosis of the pharynx and tongue, and there were a few necrotic nodules in the proventriculus.

After 154 days the mucous membrane of the small and large intestine was studded with yellow tubercles the size of rape-seed. The Peyer's patches projected as rounded tumours on the peritoneal surface of the intestine, and there was a nodule the size of a pea connected to the small intestine by a narrow neck.

After 173 days there were caseous nodules in the pharynx, oesophagus, crop, and gizzard. The mucous membrane of the small and large intestines was beset with numerous caseous nodules up to a wheat grain in size. The Peyer's patches formed on the peritoneal surface prominent nodules, which were slightly constricted at their point of attachment to the intestine; internally they were hollow, ulcerated, and lined by yellow necrotic substance to which faecal matter was adherent. The glandular tissue at the entrance to the caeca was affected in a similar manner to the Peyer's patches.

In addition to this series of five fowls three others were fed with tuberculous material. One developed tuberculosis similar to that just described; the nodules formed by the enlarged and ulcerated Peyer's patches showed very markedly the tendency to become constricted at their attachment to the intestine. Of the two remaining, which received small doses of the original material of Virus AI, one showed no tuberculosis, the other had a few tubercles in the liver and spleen and no tuberculosis elsewhere.

With Culture (*Tabular summary*, pages 201–204).

The doses of culture were administered to the fowls in a little salt solution which was allowed to drop from a pipette into their mouths: the smallest dose given was 10 mg. Ten fowls were fed in this way, seven with 10 mg. of culture and three with the growth from one and two glycerin serum tubes. Eight died in from 63 to 202 days; two were killed after 92 and 140 days respectively.

The results show that the method of administration of a dose of culture to a fowl by means of a pipette is unsatisfactory, since in seven out of the ten fowls there was severe disease of the larynx caused by inhaling the culture.

In other respects the disease produced resembled that following the natural method of feeding with tuberculous tissues. The alimentary tract was in the majority of cases affected from pharynx to rectum. The cervical glands on each side of the neck were often replaced by caseo-necrotic substance. In several instances the heads of the limb bones contained caseous nodules, but in none was there any disease of joints although two of the experiments lasted 200 days.

INOCULATION AND FEEDING EXPERIMENTS WITH MAMMALIAN TUBERCLE BACILLI.

INTRODUCTION.

These experiments have been performed and are included here in order to compare the effects of the inoculation of fowls respectively with cultures of mammalian and avian tubercle bacilli. The cultures of mammalian tubercle bacilli were originally derived from the ox, pig, horse, antelope, and chimpanzee, and the results with these various mammalian viruses have been grouped together under each form of inoculation since there has been shown no constant difference in their effects on fowls though they differ in virulence for rabbits. In many instances cultures have been recovered from fowls experimentally inoculated and these cultures, exhibiting their original characters, have been again used to inoculate other fowls. The full account of the passage experiments on fowls is given in the report on modification experiments, but it may be stated here that, although very numerous cultural investigations have been made, there has been only a single instance (Fowl 282) among the fowls included in this summary where a culture different from that inoculated has been isolated.

Intravenous (*Tabular summary*, pages 206–210).

After the intravenous inoculation of moderately large doses (from 10 to 50 mg.) of culture of mammalian tubercle bacilli, fowls invariably become ill, anaemic, and rapidly lose flesh. While in this condition they may die in from 10 to 60 days, or they may

Fowls.

slowly recover ; those fowls which die usually exhibit certain changes in the organs, and these changes may be present in fowls which are recovering but which are killed before the end of 60 days.

Apparently mammalian tubercle bacilli have a toxic action on fowls, and when inoculated intravenously in sufficient numbers may cause death or not, according to the individual resistance of the animal. The bacilli do not increase markedly in the tissues, and in the event of the animal's recovery they are gradually destroyed and ultimately disappear completely. They survive, however, for a considerable time, and cultures have been recovered from the livers of fowls, whose organs were apparently healthy, after periods up to a hundred days. Out of 44 fowls inoculated with 10 mg. and 5 with more than 10 mg., 23 succumbed in from 10 to 60 days, the average duration of life being 29 days ; 26 were killed after periods ranging up to 157 days, and the majority of them were recovering from the effects of the inoculation.

Out of 15 fowls inoculated with less than 10 mg. (from 1 mg. to 6 mg.), two died in 16 and 19 days respectively, and 13 were killed in from 42 to 244 days.

The post-mortem examinations revealed considerable variation in the amount of tissue reaction produced. In 18 instances the organs appeared normal, though in several tubercle bacilli were demonstrated in small numbers in smear preparations. In 32 the most marked feature was either congestion and oedema of the lungs, or enlargement and pallor of the liver, together with necrotic foci in the substance, but without any visible tubercles.

In 14 fowls, of which some died and some were killed, inoculated with doses varying from 1 mg. to 50 mg., the lungs contained typical tubercles. In some they were numerous, minute, and transparent, and only a few showed opaque centres ; in others they were minute, opaque, and yellow throughout, and were easily picked out of the lung substance, while in several cases they were typical encapsuled caseous tubercles up to a rape-seed in size.

All these lesions just described may be found to a certain extent in a single fowl, and the following may be taken as an example of the post-mortem appearances in a fowl which has died in from 10 to 60 days. The body is extremely emaciated and bloodless ; the liver is large, pale, and soft, and beset with irregular yellowish-grey necrotic foci ; the spleen is swollen, the lungs are congested and oedematous and may occasionally show caseating tubercles. The kidneys are pale or normal in appearance.

INTRAPERITONEAL (*Tabular summary*, page 211).

Ten fowls were inoculated intraperitoneally with doses of culture varying from 5 mg. to 100 mg. One died in 29 days after a dose of 50 mg. ; the rest were killed in good health after periods varying from 68 to 133 days. Seven showed peritoneal tuberculosis in the form of scattered nodules consisting of yellow necrotic substance enclosed in capsules of fibrous tissue. In three there was no evidence at all of tuberculosis. In only one out of the ten was there any disseminated tuberculosis. Fowl 282, killed after 157 days, showed a single irregular nodule in the spleen, from which a mixed culture of avian and mammalian tubercle bacilli was isolated. There can be but little doubt that this fowl was accidentally infected.

INTRAMUSCULAR (*Tabular summary*, pages 212–213).

There were 21 fowls inoculated intramuscularly, and all were killed in good condition after periods varying from 46 to 157 days, except for one which died without obvious cause after 14 days.

At the seat of inoculation there was in every case a local lesion composed sometimes of sheets of yellow caseo-necrotic substance, at others of fibrous tissue with yellowish staining of the muscle around. In smear preparations from this caseo-necrotic substance numerous tubercle bacilli could be found microscopically, many degenerate in form ; cultures showed that most of these bacilli were dead.

There was no macroscopic evidence of dissemination except for a single tubercle in the liver of each of two fowls, and a caseous focus in the intestine of a third.

FEEDING (*Tabular summary*, page 214).

Five fowls were fed with culture in doses from 1 mg. to 48 mg. All were healthy when killed in from 45 to 112 days.

INOCULATION EXPERIMENTS WITH DEAD TUBERCLE BACILLI.

(*Tabular summary*, page 214.)

The intravenous inoculation of living mammalian tubercle bacilli in moderately large doses has been shown to cause the death of about 50 per cent. of the fowls inoculated and to give rise in a certain number of cases to typical caseating tubercles in the lungs. The intraperitoneal and intramuscular inoculations, however, produce almost no effect beyond local disease at the seat of inoculation and there seems no doubt but that the results of the intravenous inoculations are due to the direct toxic action of the tubercle bacilli and are in no sense a true tuberculosis.

This view is supported by the results of the following experiments, showing that tubercle bacilli which have been killed by exposure to steam at 100° C. for half-an-hour are still capable of exerting an irritant effect on the fowl's tissues. In two of the three fowls inoculated with dead bovine tubercle bacilli and killed after 35 and 38 days respectively the lungs contained numerous minute caseating tubercles.

Three fowls were inoculated with dead avian tubercle bacilli ; one died in an emaciated condition after 46 days without any lesions. A second which received 100 mg., and was killed after 57 days, appeared normal ; the third showed moderately numerous minute tubercles in the lungs.

Out of three fowls, inoculated with killed equine and human tubercle bacilli, one had a moderate number of minute tubercles in the lungs, a few caseating ; the other two, when killed after 44 days, had lost weight and had enlarged livers and spleens.

One fowl, inoculated with 50 mg. of dead tubercle bacilli plus the powdered glass with which they were ground up, showed the lungs firm and filled with a network of confluent caseous tubercles ; the fowl inoculated as a control with powdered glass alone, when killed after 42 days, was healthy.

A fowl, inoculated intraperitoneally with 250 mg. of dead bovine tubercle bacilli, showed on the peritoneum scattered caseous nodules with grey capsules and two minute caseous tubercles in the lungs.

Thus out of 10 fowls inoculated intravenously with dead tubercle bacilli 5 when killed after five or six weeks showed tubercles in the lungs.

EXPERIMENTS ON PIGEONS.

(*Tabular summaries*, pages 215–217).

The susceptibility of pigeons to the action of cultures of avian tubercle bacilli was not made the subject of investigation. A few pigeons were inoculated intramuscularly for the purpose of comparison with those which were tested by the intramuscular inoculation of mammalian tubercle bacilli. The results were inconclusive as the animals were killed before disseminated tuberculosis had developed. The only point to be noticed is that the pigeons inoculated with avian tubercle bacilli generally diminished slightly in weight while those inoculated with mammalian tubercle bacilli generally gained.

EXPERIMENTS ON PARROTS.

INOCULATION AND FEEDING EXPERIMENTS WITH CULTURES OF AVIAN AND BOVINE TUBERCLE BACILLI.

(*Tabular summaries*, pages 218–219.)

Parrots.

Four parrots have been used for inoculation and feeding experiments with cultures of avian tubercle bacilli and six with bovine tubercle bacilli. Although the experiments are only few in number it is quite clearly shown that both types of tubercle bacilli are able to set up general progressive tuberculosis in parrots The lesions produced in parrots by each type of bacillus do not differ in macroscopic appearance and resemble those resulting from the inoculation of avian tubercle bacilli in fowls. The parrot's intestine is not so susceptible to tuberculosis as the fowl's; in the four feeding experiments with both types of tubercle bacilli the intestine of only one parrot was affected and that to a very slight extent. Owing to the small number of comparable experiments no definite conclusion can be arrived at as to the comparative virulence of the two types, but the results indicate that the bovine bacillus is more virulent for the parrot than the avian bacillus. Two parrots were each fed with 50 mg. of culture in their drinking water; the parrot fed with avian bacilli died in 113 days, while the one fed with bovine bacilli died in 83 days. After the intravenous inoculation of 0·01 mg. of culture of avian bacilli a parrot died in 113 days, while the parrot inoculated with an equivalent dose of bovine bacilli died in 36 days.

One parrot was inoculated intramuscularly with 10 mg. of avian culture and died in 95 days; two parrots inoculated, one intramuscularly, the other subcutaneously with 10 mg. of bovine culture, died in 113 and 40 days respectively.

Two parrots were fed from a pipette, one with bovine the other with avian tubercle bacilli. It was found at the post-mortem examination in each case that the culture had been inhaled and had produced caseous masses in the lungs.

EXPERIMENTS ON RABBITS.

INOCULATION AND FEEDING EXPERIMENTS WITH CULTURES OF AVIAN TUBERCLE BACILLI.

INTRODUCTION.

Rabbits.

These summaries have been compiled from the results of inoculation experiments with cultures of avian tubercle bacilli, of which nine were derived from birds and five from swine. By the intravenous method 40 rabbits were inoculated, by the intraperitoneal 23, by the subcutaneous 26, by feeding 17.

INTRAVENOUS INOCULATIONS (*Tabular summary*, page 220–224).

The intravenous inoculation of avian tubercle bacilli into rabbits in doses varying from 10 mg. to 0·01 mg., caused acute tuberculosis in all but two cases.

After the inoculation of 1·0 mg. the animals died in from 12 to 47 days; after 0·1 mg. in from 20 to 43 days; and after 0·01 mg. in from 30 to 53 days. In two cases, after the inoculation of 0·01 mg., the rabbits developed chronic tuberculosis, one dying after 145 days, the other being killed after 144 days; these two exceptional cases have been omitted in the estimation of the average duration of life.

Smaller doses, such as 0·001 mg. and 0·0001 mg., usually cause a more chronic type of tuberculosis differing in distribution from that set up by the larger doses. This, however, is not invariable, as in one case, after the inoculation of 0·001 mg. the rabbit died in 78 days of tuberculosis similar in distribution to that produced by 0·1 mg. or 0·01 mg., but differing in the greater size of the lesions.

The acute tuberculosis in rabbits following the intravenous inoculation of avian tubercle bacilli is characterised by great diversity in the extent to which the organs are affected, but the distribution is similar in all cases. The differences in the disease pictures depend almost entirely upon the duration of life of the animal, and since there is a great variation in the duration of life after equivalent doses, all gradations of disease can be observed in the rabbits inoculated with 1·0 mg.

In the most acute cases, in which death occurs after about 14 days following the inoculation of 1·0 mg. of culture, the spleen is usually slightly enlarged and firmer than normal. The liver may be quite normal in appearance, or may have the interlobular tissue well marked. The kidneys are pale and show no lesions. The lungs are pink in colour and collapse well, but are a little oedematous. The lymphatic glands appear normal. The tissues of the body generally are very pale.

In rabbits which have lived a little longer, about 20 days, the spleen is more enlarged and grey foci are visible in it and in the liver. In the lungs and kidneys a few translucent foci may be seen. In both cases smear preparations from the liver, spleen, and bone marrow show very large numbers of tubercle bacilli, which in the liver often occur in clumps having a characteristic rosette formation.

If the rabbit lives a still longer period, as for example Rabbit 1182, which survived 32 days, the spleen becomes greatly enlarged and the surface beneath the capsule is mottled with greyish white foci or small irregular whitish nodules. On section the pulp is firm and the Malpighian bodies are enlarged, forming a network of grey translucent tissue. In the substance of the liver most evident from the surface can be seen numerous markedly irregular grey foci. The kidneys are pale and only occasionally show a few transparent points. The lungs collapse fairly well and are oedematous, but not congested to any great extent; often there are no visible tuberculous lesions, but sometimes scattered minute caseating tubercles can be seen beneath the pleura and in the parenchyma.

Except for the portal, bronchial, and ventral mediastinal glands, which are usually enlarged and oedematous, and occasionally contain opaque caseous foci, the lymphatic glands show nothing abnormal. In the areolar tissues of the axillary, inguinal, and pubic regions, in the retroperitoneal tissues, and on the peritoneum and mesentery are often seen discrete opaque whitish tubercles which by microscopical examination of smear preparations are shown to contain very numerous tubercle bacilli.

It is unnecessary to give detailed summaries of the lesions occurring after the doses of 0·1 mg. and 0·01 mg., since they are similar to those produced by the 1·0 mg., differing as a general rule only in their greater size and in the greater enlargement of the spleen owing to the longer duration of life.

The dose of 0·01 mg. appears to be on the border line between those doses which always cause acute tuberculosis and those which cause chronic tuberculosis. One or the other type of disease may result, as the rabbit happens to be more or less susceptible.

After the intravenous inoculation of 0·001 mg. and 0·0001 mg. of culture, and occasionally 0·01 mg., a chronic type of tuberculosis is obtained which is in no way different from that following subcutaneous inoculations and small intraperitoneal doses. It has a very characteristic distribution of lesions, and the description is given in the summary of the subcutaneous inoculations.

Two rabbits were inoculated with doses consisting respectively of a hundred-thousandth part and a ten-millionth part of 1·0 mg. of culture. Both developed chronic tuberculosis, the latter dying in 198 days.

INTRAPERITONEAL INOCULATIONS (*Tabular summary*, pages 225–228).

The intraperitoneal inoculation of cultures of avian tubercle bacilli into rabbits in doses varying from 5 mg. to 0·1 mg. produces a fatal tuberculosis resembling that following the intravenous inoculation of similar doses. The duration of life is, however, more prolonged in the majority of cases and exhibits greater irregularity.

After the inoculation of 5 mg. of culture intraperitoneally two rabbits died of acute tuberculosis in 9 and 13 days respectively.

After the inoculation of 1·0 mg. the rabbits die in from 17 to 59 days; after 0·1 mg. in from 30 to 85 days. There were a few exceptions; two of the rabbits inoculated with these doses died prematurely, and three developed very chronic tuberculosis, probably owing to the whole of the inoculation not having been intraperitoneal; these have been omitted in estimating the average duration of life. There was a single dose of 0·01 mg. and this resulted in the production of chronic tuberculosis.

The following is a description of the lesions occurring in rabbits which die in about the average time of 29 days after the intraperitoneal inoculation of 1·0 mg. of culture:—

The omentum is retracted and slightly thickened along the free margin by translucent tissue containing caseous streaks and foci. On the peritoneum, mesentery, and mesocolon, numerous minute grey and greyish white tubercles are seen; on the parietal peritoneum they mainly occur in the dorsal regions. The spleen is swollen but not so greatly enlarged as after an intravenous inoculation, and speckled with greyish white foci. Numerous grey points may be just visible in the liver substance. The kidneys and the lungs contain a very variable number of minute grey tubercles with caseating centres. The ventral mediastinal glands are often caseous throughout and there is usually some caseation of the portal, iliac, and bronchial glands. In animals which live a longer or a shorter period the lesions are more or less evident. The lungs more often contain caseating tubercles after this form of inoculation than after the intravenous.

After the dose of 0·1 mg. the lesions may resemble those produced by the 1·0mg. dose in animals which have lived longer than the average time, or the disease may become still more chronic and approximate in type to that following a subcutaneous inoculation. In the animal inoculated with 0·01 mg., which was killed after 198 days, the distribution of the lesions was similar to that following a subcutaneous inoculation, slight peritoneal tuberculosis taking the place of a subcutaneous local lesion.

SUBCUTANEOUS INOCULATIONS (*Tabular summary*, pages 228–232).

Rabbits have been inoculated subcutaneously with cultures of avian tubercle bacilli in doses varying from 50 mg. to 0·0000001 mg. The total number of animals inoculated was 26, of which 7 were killed and 19 died after periods varying from 9 to 176 days, and in only two or perhaps three of these latter cases was the visceral disease extensive enough to account for death. In nine, death was due to various causes other than tuberculosis, of which two could not be ascertained. The remaining seven developed extensive disease of the joints which must have had some influence in producing the fatal result, whether indirectly from disability or directly from absorption of toxins. It is obviously useless to give an average duration of life for the different doses by this method of inoculation since two animals, one inoculated with 50 mg. of culture, the other with 0·1 mg., may die after about the same period of time with tuberculosis almost identical in degree.

The tuberculosis set up in rabbits by the subcutaneous inoculation of avian tubercle bacilli is very chronic and has a characteristic distribution, no matter how varied the doses may be.

Rabbits.

At the seat of inoculation, which was in all but three cases in the subcutaneous tissues of the back, there is found a thin fibrous-walled tumour whose size varies with the dose of culture. The tumour is sometimes composed of firm caseated tissue but more often it is cystic and filled with caseo-pus. Ulceration of the skin may occur and the tumour become secondarily infected but it is more usual for the skin to remain intact. The nearest lymphatic glands may either be partly caseous or contain a few soft caseous nodules or be simply enlarged and oedematous. The spleen is almost invariably normal in appearance and in only three out of the total number of rabbits was it affected; in one, after 50 mg., there were numerous yellowish rape-seed sized tubercles and in each of the other two a single yellowish tubercle. The liver is rarely affected. In the abstracts of the post-mortem examinations caseating nodules have been described occasionally in the liver in which tubercle bacilli could not be demonstrated; such nodules are not due to tubercle bacilli and may be found in non-experimental rabbits. The amount of disease in the kidneys varies very much. There are sometimes moderately numerous caseating tubercles ranging up to a millet seed in size which rarely become larger or project to any extent above the surface. At other times there is a single tubercle, alone or together with irregular pits on the surfaces of the cortices from the bottom of which caseous streaks extend through the pyramids. The pelves of the kidneys have not been found to contain caseo-pus. The lungs are almost invariably pink and crepitant and perhaps a little oedematous; they show mainly just beneath the pleura discrete caseating tubercles, often very few in numbers and rarely more than moderately numerous, and also caseous nodules in the margins of the lungs. The tuberculosis of the lymphatic glands is never extensive, being mainly confined to those nearest to the tumour, to the ventral mediastinal and the bronchial glands. In these the lesions are sometimes gritty and there may be calcareous foci in other lymphatic glands. The areolar tissues of the axillary and inguinal regions often contain minute caseating tubercles. The testes may contain caseating nodules. The most characteristic feature of this chronic form of tuberculosis is the affection of the joints. If the rabbit lives a sufficient time, some or many of the limb joints are certain to be tuberculous. They are swollen, the synovial membrane is thickened, and the cavity of the joint is filled with soft caseous substance which projects on all sides and extends between the muscles. In one rabbit, which was killed 198 days after a dose of 1·0 mg., the only disease beyond the local lesion was tuberculosis of a shoulder joint. The disease does not apparently originate in the bones, since the heads of the bones are rarely affected.

Two rabbits were inoculated with very small doses, 0·001 mg. and 0·0000001 mg., and were killed after 258 and 305 days respectively.

The first was in a dying condition and had tuberculosis of the majority of the limb joints and of the testes, and caseous nodules in the lungs and kidneys.

The second showed no local lesion nor any sign of tuberculosis in the body; the fowl, inoculated subcutaneously with an equivalent dose of the same suspension of culture, developed tuberculosis of the liver and spleen.

FEEDING EXPERIMENTS (*Tabular summary*, pages 232–235).

Rabbits have been fed with cultures of avian tubercle bacilli in doses varying from 50 mg. to 1·0 mg. In every case the dose has been administered on a single occasion by means of a pipette. In all 17 rabbits have been fed, of which 11 died in from 42 to 323 days after feeding, and 6 were killed in good health after periods ranging from 28 to 496 days.

Of the 11 rabbits which died, only one, No. 1180, dying in 323 days after a dose of 10 mg., had generalised tuberculosis at all severe. In four there was slight tuberculosis of the principal organs associated with fairly extensive disease either of the intestinal tract or of the joints; in five, of which three died of definite intercurrent diseases, the tuberculosis was only slight in extent and obviously insufficient to have caused death. The remaining rabbit, which died in 86 days after feeding with 10 mg., showed no sign of tuberculosis (the rabbit fed with 20 mg. of the same culture developed disseminated tuberculosis).

Rabbits.

The general result in those animals which lived a sufficient time, has been the production of a chronic form of tuberculosis resembling in the distribution of disseminated lesions that following a subcutaneous inoculation. There has been shown a great variability in the extent of the disease after equivalent doses, and its progress is often extremely slow.

The following is a summary based upon an analysis of the above-mentioned 17 cases. Since the incidence of the disseminated lesions occurring after feeding is identical with that following a subcutaneous inoculation, it is only necessary to describe the tuberculosis of the alimentary tract and the glands in association.

The tonsils were affected in five rabbits; the lesions in three were caseous foci, in two there were ulcers with thickened caseous bases 2 mm. and 1 cm. in diameter. The small intestines showed tuberculous disease in more than half the number of rabbits; the lesions varied from a few caseous foci in the Peyer's patches to fairly numerous caseous nodules up to 1 cm. in diameter, ulcerated internally. The colon and caecum were frequently affected, and the nodules and ulcers were usually larger than in the small intestine. The larger nodules had a characteristic formation: they projected as rounded tumours on the peritoneal surface of the gut, with which they communicated by openings. These openings tended to become more and more constricted until the nodules were almost completely cut off from the lumen of the intestine.

In three instances the lymphoid tissues of the blind end of the caecum and the dilated end of the ileum were replaced by a thick layer of opaque caseous tissue ulcerated internally; also in these situations there were often collections of soft yellow substance containing tubercle bacilli.

The lymphatic glands in connection with the alimentary tract were almost invariably affected, the submaxillary glands most often, the mesenteric next, and the cervical and pharyngeal occasionally. The submaxillary glands were on one occasion enlarged, cystic, and filled with soft caseous substance, but usually they were only slightly enlarged and contained caseous patches or calcareous granules. The mesenteric glands were never severely affected; at the most they contained a few caseous tubercles or foci, which were often gritty. The pharyngeal glands, when tuberculous, were either partly caseous or contained caseous foci.

INOCULATIONS WITH EMULSIONS OF TUBERCULOUS MATERIAL CONTAINING AVIAN TUBERCLE BACILLI.

(*Tabular summary*, pages 235–237.)

The results of the inoculation of emulsions of tuberculous tissues containing avian tubercle bacilli correspond in general with those following the inoculation of culture. The total number of rabbits inoculated was 21 and the material was derived from calves, pigs, rabbits, cat, guinea-pigs, and birds. The numbers of bacilli in the doses were not estimated and no attempt can be made to compare the relative virulence of tubercle bacilli in cultures and tissue emulsions.

Acute tuberculosis, fatal in 19 and 24 days, was set up in two rabbits after the intravenous inoculation of material containing numerous tubercle bacilli, and in one rabbit in 23 days after an intraperitoneal inoculation. In the rest, after intraperitoneal and subcutaneous inoculations, the usual chronic form of tuberculosis resulted. Four rabbits were inoculated directly into the substance of the lung, and of these, two developed severe local (lung) tuberculosis and the usual chronic form of disseminated disease.

COMPARISON OF THE TUBERCULOUS DISEASE PRODUCED IN RABBITS BY CULTURES OF AVIAN AND BOVINE TUBERCLE BACILLI UNDER THE VARIOUS FORMS OF INOCULATION.

INTRAVENOUS INOCULATIONS.

There is a great resemblance between the acute diseases following the intravenous inoculation of avian and bovine tubercle bacilli, but there are certain definite points of distinction. The most striking difference is observed in the condition of the lungs. After the inoculation of bovine tubercle bacilli in doses sufficient to produce acute tuberculosis, the lungs in the majority of cases become solid and composed of reddish-grey tissue beset with caseous foci; at other times they are closely filled with caseating tubercles. After the inoculation of avian tubercle bacilli the lungs in this series of experiments have never been so severely affected; they have been invariably pink and crepitant, usually oedematous, and have only occasionally showed scattered caseating tubercles. The liver has much the same appearance after the inoculation of either type of bacillus, but in the case of the avian tubercle bacillus the substance is less often peppered with grey foci. The condition of the spleen resembles that of the liver but bovine tubercle bacilli rarely cause the enormous enlargement sometimes produced by the avian bacilli. The kidneys after the inoculation of bovine tubercle bacilli almost always contain translucent and caseating tubercles; after avian tubercle bacilli they share in the general anaemia and only rarely show a few transparent foci. The lymphatic glands are only slightly affected by avian tubercle bacilli. The multiplication of avian tubercle bacilli in the tissues is greater than that of bovine tubercle bacilli.

INTRAPERITONEAL.

The local reaction is not so severe after the intraperitoneal inoculation of avian bacilli as after bovine. This is shown by the invariably slighter thickening of the omentum and the fewer tubercles in most cases on the peritoneum and mesentery. In all other respects the same differences obtain as after the intravenous method of inoculation, with the exception that the lungs more often contain caseating tubercles than after the latter method.

SUBCUTANEOUS.

If the lesions resulting from the subcutaneous inoculation of equivalent doses of culture, which may vary from 0·1 mg. to 50 mg., be compared, the difference in the effects produced by avian tubercle bacilli on the one hand, and bovine tubercle bacilli on the other hand, is very marked. But the difference is one of degree only. The avian tubercle bacillus has less virulence for the rabbit than the bovine tubercle bacillus (as is shown by the comparative table at the end of this summary), and almost invariably gives rise to chronic tuberculosis after inoculations which are less severe by reason of method and dose. The bovine tubercle bacillus, even in very small doses, produces fatal general tuberculosis, although it is important to remember that occasionally very chronic tuberculosis results from the inoculation of doses containing few bovine bacilli. This latter form of tuberculosis may be identical in distribution with the chronic tuberculosis which is almost the invariable rule after subcutaneous inoculations of avian tubercle bacilli; there is the same tendency for the joints testes, and areolar tissues to become the seat of tuberculous changes, but never to so marked an extent after bovine tubercle bacilli as after avian.

The avian tubercle bacillus causes generally less visceral disease than the bovine bacillus; after the latter the lungs and kidneys are very seriously affected, and the liver and spleen only seldom, while after the former the lungs and kidneys are usually only slightly affected, and the liver and spleen very rarely affected at all. The almost complete replacement of lung tissue by caseous masses, which is seen so frequently with the bovine tubercle bacillus, is never seen after the inoculation of avian tubercle bacilli.

Rabbits.

TABLE SHOWING COMPARATIVELY THE DURATION OF LIFE OF RABBITS INOCULATED WITH CULTURES OF AVIAN AND BOVINE TUBERCLE BACILLI RESPECTIVELY.

Avian.					*Bovine.*
Method of Inoculation.	Dose.	Number of Rabbits Inoculated.	Duration of Life in Days.	Average.	*Average.*
Intravenous	1·0 mg.	13	12–47	21·9	*14·3*
„	0·1 mg.	9	20–43	28·7	*20·3*
„	0·01 mg.	6	30–53	43·3	*30·5*
Intraperitoneal	1·0 mg.	11	17–59	29·3	*17·8*
„	0·1 mg.	4	30–85	48·7	*22·9*

EXPERIMENTS ON MICE.

INOCULATION EXPERIMENTS WITH CULTURES OF AVIAN TUBERCLE BACILLI AND FEEDING EXPERIMENTS WITH TUBERCULOUS TISSUES.

Mice.

INTRAPERITONEAL (*Tabular summary*, pages 237–238).

Two series containing 11 mice were inoculated with cultures from Viruses A IV and A X, in doses varying from 0·01 mg. to 40 mg. All but one of the animals died in from 26 to 348 days.

The Mouse No. 99, inoculated with the smallest dose, 0·01 mg., was killed in good condition after 350 days. It was healthy except for a pea-sized nodule in the omentum, and no tubercle bacilli could be demonstrated in the liver, spleen, lung, and kidney.

The Mouse No. 100, which received 0·1 mg., died after 191 days; there were no tubercles in the organs, but tubercle bacilli were very numerous in the lung and spleen, moderately numerous in the liver and kidney.

Mouse 98, inoculated with 0·2 mg., died in 180 days; there were a few translucent foci in the lungs and a few bacilli in the organs.

After the inoculation of the larger doses, from 1 mg. to 40 mg., the mice died after periods varying from 26 to 348 days, the duration of life not corresponding with the size of the dose. Smear preparations showed great multiplication of tubercle bacilli in the tissues.

The lesions found were as follows:—The omentum was either slightly thickened or contained a few nodules filled with soft yellow substance. The spleen was enlarged, and occasionally speckled with grey points. The liver was apparently normal. In one mouse which died in 348 days, the surfaces of the kidneys were pitted. The lungs were usually congested and reddish-grey in colour; in rather more than half the mice the lungs contained grey nodules, sometimes numerous, varying up to 4 mm. in diameter.

SUBCUTANEOUS (*Tabular summary*, page 239).

Two series of mice were inoculated subcutaneously with cultures of viruses A IV and A X, the doses varying from 0·2 mg. to 50 mg. Eight died in from 81 to 280 days, and four were killed after 243, 333, 350, and 127 days.

The lesions produced were much more marked than after intraperitoneal inoculations, but the extent of the disease bore no relation to the size of the dose. For example, Mouse 84, inoculated with 1 mg., died after 200 days of severe general tuberculosis; Mouse 85 received 2 mg. of the same culture, and when killed after 243 days was in good condition and the organs were apparently normal though containing a moderate number of tubercle bacilli. Mice appear to differ in their susceptibility to avian tubercle bacilli; for another, Mouse No. 102, inoculated with 1 mg., was killed in good health after 350 days, and except for a small ulcer at the seat of inoculation and a grey nodule in the lung was healthy; no tubercle bacilli were demonstrated in the spleen and liver. The majority of mice, however, will succumb to doses of culture varying from 1 mg. upwards and the naked eye characters of the disease are as follows:—At the seat of inoculation in the subcutaneous tissues a caseous nodule develops which softens and is usually discharged through an ulcer in the skin. The nearest lymphatic glands become enlarged and firm but do not caseate. The spleen is swollen and shows grey points beneath the capsule; similar foci may be seen in the liver. The lungs contain nodules composed of firm grey and greyish-white tissue which may be so numerous as to completely replace the lung substance; the condition is analogous to what occurs in the lung of a rabbit after the subcutaneous inoculation of bovine tubercle bacilli.

There may be, however, very little tissue reaction and death be due to multiplication of tubercle bacilli in the organs just as after intraperitoneal inoculations, though the multiplication is never so great.

FEEDING (*Tabular summary*, page 240).

Nine mice were fed with pieces of the livers of two calves containing numerous tubercle bacilli and were killed (two died) at intervals from 29 days to 400 days after the date of feeding.

The first, Mouse 71, killed after 29 days, appeared healthy, and no tubercle bacilli were demonstrated in smear preparations.

The second, Mouse 72, was killed after 57 days; the Peyer's patches, which were a little prominent, and the mesenteric glands, contained tubercle bacilli.

After 78 days the Peyer's patches of Mouse 73 were firm and showed whitish foci; there were a few whitish streaks in the mesenteric glands; T.B. were numerous in the intestine and mesenteric glands; there were a few in the lung and spleen.

After 106 days there were, in addition to the above local changes, six translucent foci in the lungs.

After 120 days the changes were similar to those in Mouse 73.

After 144 days the mesenteric glands were enlarged and caseating; the spleen was swollen and there were two foci in the lungs; T.B. were found in all the smear preparations.

In 223 days Mouse 75 died of general tuberculosis. The intestinal mucous membrane was speckled with whitish foci; the Peyer's patches were enlarged. The spleen was beset with grey nodules, and there were numerous grey points and tubercles in the liver. The lungs were closely filled with grey nodules. The scraping from the intestine microscopically resembled pure culture.

After 379 days there was only a small grey patch in the lung, and T.B. were moderately numerous in the mesenteric gland, lung, and spleen.

The last, Mouse 82, died after 400 days, and was normal except for slight swelling of a mesenteric gland, in which there were numerous T.B.; a few bacilli were also seen in the intestine and spleen.

A tabular summary of the results of feeding mice with mammalian tubercle bacilli is given on pages 241–242 for comparison with the above.

EXPERIMENTS ON CALVES.

INOCULATION EXPERIMENTS WITH CULTURES OF AVIAN TUBERCLE BACILLI AND WITH TISSUE EMULSIONS, AND A FEEDING EXPERIMENT WITH CULTURE.

Subcutaneous (*Tabular summaries*, pages 242–244 and 257).

Calves.

The virulence of the avian tubercle bacillus for calves has been tested by the subcutaneous inoculation of culture in doses ranging from 10 mg. to 500 mg. Fifteen calves have been inoculated with culture from ten viruses, of which five originated from swine and five from birds. In no case was there any disturbance of the general health as a result of the inoculation and the animals were killed when well after periods varying up to 181 days. The following is a summary of the lesions produced.

At the seat of inoculation in the subcutaneous tissues there is formed a non-infiltrating tumour which usually becomes a cyst consisting of fibrous walls and caseo-purulent contents. The prescapular gland on the side of the local lesion is not greatly enlarged but either is almost completely replaced by caseo-necrotic gritty tissue or contains caseous gritty nodules which may soften and become caseo-purulent.

In seven calves, one of which received 500 mg. (the largest dose given) there was no disease beyond that described at the seat of inoculation and in the adjacent prescapular gland. The remaining seven (excluding Calf 390) showed some amount of dissemination, but the lesions were only slight and non-progressive. They consisted of caseo-purulent foci in the intestinal mucous membrane or Peyer's patches, and in the thoracic, mesenteric, and other lymphatic glands; occasionally calcareous tubercles were seen in the lungs, spleen, liver, and suprarenal bodies. One of the calves was only nine days old when inoculated with 100 mg., and at the post-mortem examination 92 days later showed local tuberculosis only.

From all the calves but one (No. 402) cultures were recovered to verify the cause of the lesions produced, and with two exceptions they were identical with those inoculated. The two exceptional cases, Calves 456 and 390, are considered fully under the modification experiments. It is sufficient here to state that from the prescapular gland of Calf 456, in which there was no disseminated disease, a virulent mammalian culture was isolated. A similar culture was isolated from a nodule occurring in the lung of Calf 390.

Three calves were inoculated subcutaneously with tissue emulsions made from the livers of two calves (Nos. 566 and 570) at the end of the intravenous passage experiments.

Two of these showed, when killed after 163 days, the usual slight amount of disease, and the cultures recovered were avian in character. The third, Calf 574, showed, in addition to very slight local disease, a fibro-caseous nodule, with a few tubercles around, in a left bronchial gland from which a typical mammalian culture was gained resembling a bovine tubercle bacillus in characters and in virulence for rabbits and guinea-pigs; from the prescapular gland an avian culture was recovered which caused only local disease in two guinea-pigs subcutaneously inoculated.

Intravenous (*Tabular summaries*, pages 245 and 256).

The intravenous inoculation of calves with avian tubercle bacilli, either in culture or tissue emulsions, has in these experiments almost invariably caused a fatal result.

Four calves have been inoculated with culture, in doses varying from 10 to 200 mg.; they all died in from 30 to 40 days of acute tuberculosis. Eight calves have been inoculated with tissue emulsions, and the duration of life has varied from 31 to 45 days. Only one emulsion was estimated and it was found to contain 30 million bacilli per cubic centimetre.

The following is a summary of the lesions produced and includes the results obtained both with cultures and tissue emulsions. The lungs are the tissues most severely affected, and their condition varies from complete consolidation to great congestion and oedema with patches of consolidation. In two calves inoculated with culture the solid lung tissue was beset with caseous patches, in some parts extensive.

The spleen is usually enlarged, though not invariably; on a few occasions it has shown necrotic patches. In the liver there frequently occur irregular grey foci. The majority of the lymphatic glands are congested and oedematous; sometimes the thoracic, portal and mesenteric glands are firm and show caseous patches. Smear preparations made from the lung, liver, spleen, kidney and various lymphatic glands contain numerous tubercle bacilli, and large numbers can be demonstrated in scrapings made from the mucous membrane of the intestines.

Feeding (*Tabular summary*, page 252).

A single calf, No. 556, was fed in its drinking water with 1 gramme of culture. When killed after 205 days, the only lesions found were a few soft yellowish foci in each of three rectal glands, from one of which an avian culture was isolated. The animal was otherwise perfectly healthy; its age at the date of feeding was eight weeks.

EXPERIMENTS ON PIGS.

INOCULATION AND FEEDING EXPERIMENTS WITH CULTURES OF AVIAN TUBERCLE BACILLI AND WITH TISSUE EMULSIONS.

Intravenous (*Tabular summaries*, pages 247 and 258).

Pigs.

Three pigs were inoculated intravenously, two with 50 mg. of culture and one with 10 mg. The two former died after 47 and 51 days respectively, the latter after 70 days, and in all the type of disease was very similar to that following the intravenous inoculation of calves with avian tubercle bacilli. The bodies were emaciated; the lungs were heavy, very oedematous, and either congested or consolidated in patches. The spleens were slightly swollen; the portal glands showed small yellowish-grey patches or necrotic streaks. Tubercle bacilli were numerous in smear preparations made from the lung, liver, spleen, intestine, and mesenteric glands.

One pig, No. 236, was inoculated intravenously with 5 cc. of an emulsion made from the mesenteric gland of Calf 566 (an animal in the intravenous passage experiment, Virus A. X). It died after 120 days. In the lungs there were several reddish-grey areas and numerous translucent tubercles, the majority with calcareous centres. Several of the lymphatic glands were firm and filled with a fine yellowish network. Tubercle bacilli were very numerous in the lesions and in a smear preparation from the spleen substance; a few were found in the bone marrow.

Intraperitoneal (*Tabular summary*, page 246).

Two pigs were inoculated intraperitoneally in each case with 10 mg. of culture. They were killed when well after 69 days and 106 days respectively. The former, Pig 104, showed at the post-mortem examination a moderate amount of peritoneal tuberculosis and tuberculosis of the abdominal lymphatic glands; there were a few foci in the liver, kidneys and lungs, and no tuberculosis elsewhere.

In the second animal, Pig 182, there was a similar amount of disease visible to the naked eye, and in addition caseous nodules in the majority of the mesenteric glands. Smear preparations, made from the apparently normal substance of the spleen, liver, and many lymphatic glands, and also from the mucous membranes of the small and large intestines, showed numerous tubercle bacilli.

SUBCUTANEOUS (*Tabular summary*, pages 245 and 246).

Five pigs were inoculated subcutaneously with cultures derived from four viruses, of which two originated from swine and two from birds. The doses were 5, 50, and 100 mg. and the animals were killed in good health after periods varying from 105 to 215 days.

At the seat of inoculation a soft caseous encapsuled tumour was formed, over which in one case the skin ulcerated and subsequently healed after the discharge of the tumour contents. The inguinal glands adjacent to the tumour contained soft caseous nodules. In one, Pig 264, there was no disease beyond the local lesion and a caseous nodule with a few gritty foci in the nearest lymphatic glands. Three showed slight evidence of dissemination in the shape of a few tubercles in the lymphatic glands and liver.

The fifth animal, No. 180, although apparently in good health when killed 105 days after inoculation, showed, in addition to the usual local disease, tubercle bacilli in smear preparations from the lung, spleen, liver, and kidneys. There was also fairly extensive caseation of the mesenteric glands, and smears showed very numerous tubercle bacilli in these glands and in the mucous membrane of the small intestine.

FEEDING (*Tabular summaries*, pages 253–254 and 257–258).

Seven pigs were fed with cultures from four viruses of which two were derived from swine and two from birds. The doses varied from 50 to 100 mg.; in two cases they were not estimated. The post-mortem results showed considerable variation in amount of disease but in no instance were there any progressive lesions in the organs.

Three pigs, Nos. 198, 200. and 196, which were fed each with 50 mg., were killed in good health after 111, 126, and 142 days respectively. In each case there were caseous gritty nodules in the mesenteric glands but no disease of the intestines. One only showed a single caseous tubercle in a submaxillary gland and an opaque focus in a bronchial gland,

Out of the seven there were two of which each was fed with the growth from seven serum tubes, one in a single feed and the other for seven consecutive days. The latter, Pig 112, was killed after 51 days. In the intestinal mucous membrane and Peyer's patches there were numerous small ulcers and erosions; they were shallow, the margins and bases were not thickened, and the peritoneal surfaces were normal; smear preparations from the mucous membrane showed moderately numerous tubercle bacilli. All the mesenteric glands were enlarged, firm, and showed whitish streaks and foci. There was no disseminated disease, and no tubercle bacilli could be detected in smear preparations from the organs. The animal which received the single feed, Pig 110, was allowed to live for 159 days, and was well when killed. The appearance of the long Peyer's patch suggested previous erosion and regeneration, but otherwise the intestine was normal. The mesenteric glands contained dry caseo-calcareous substance. The organs were normal except for two grey nodules of doubtful nature in the lungs.

The remaining two pigs (178 and 176) were fed at the same time with the same culture which had disseminated over the bodies of the two animals, Pigs 180 and 182, inoculated subcutaneously and intraperitoneally respectively, but without apparent disturbance of their general health. They received 100 mg. and 50 mg. respectively given in milk. The former, No. 178, was killed after 101 days, and at the post-mortem examination there were only slight changes in the mesenteric, portal, and coeliac glands. The examination of smear preparations showed that there were numerous tubercle bacilli all over the body, very numerous in the intestinal mucous membrane. Since dissemination and multiplication of tubercle bacilli had occurred in three out of the four animals tested with this particular culture, it was considered probable that the fourth, No. 176, *i.e.* the pig fed with 50 mg., would be similarly affected, and in support of this presumption fairly numerous acid fast bacilli were demonstrated in smear preparations from the faeces made about 15 weeks after feeding. Pig 176 was therefore allowed to live for a long period, 315 days, to determine what the ultimate fate of the bacilli which were presumed to be disseminated about the body would be. When it was killed in good health there were found caseo-calcareous tubercles and nodules in the submaxillary, mesenteric, colic, portal and iliac glands, and no disease elsewhere. Microscopical examination failed to demonstrate any tubercle bacilli in the organs, and no growth occurred on culture tubes of egg medium sown from the iliac, submaxillary, and mesenteric glands.

Two pigs, Nos. 246 and 234, were fed with tuberculous tissues containing numerous tubercle bacilli. Pig 246 was killed 93 days later, and had tuberculosis of the mesenteric and colic glands and four translucent tubercles (no T.B.) in the lungs. Pig 234, which ate the whole of the spleen of Calf 566, Virus A X, and was killed after 164 days, had one caseous miliary nodule only (T.B.) in a submaxillary gland, and no disease elsewhere.

EXPERIMENTS ON HORSES.

INOCULATION AND FEEDING EXPERIMENTS WITH CULTURES OF AVIAN TUBERCLE BACILLI.

INTRAVENOUS (*Tabular summary*, page 252).

One pony, No. 32, was inoculated intravenously with 10 mg. of culture and died in 15 days. The lungs were heavy, congested, and oedematous. The spleen was swollen and dark red; the liver was pale. Tubercle bacilli were only moderately numerous in smear preparations made from the lung and scanty in smears made from the liver, spleen, and kidney, the prescapular and mesenteric glands.

SUBCUTANEOUS (*Tabular summary*, page 252).

Two ponies were inoculated subcutaneously, one, Pony 10, with 100 mg. of culture, the other, Pony 2, with 50 mg.

The former died after 38 days of acute septic peritonitis of which the primary cause could not be discovered. The only evidence of tuberculosis was a fibrous-walled cyst at the seat of inoculation and necrosis of several of the prescapular glands.

The second animal was killed when well after 158 days and the post-mortem examination showed a small ulcer at the seat of inoculation and a caseous nodule in each of two prescapular glands. There was no other disease except for a grey patch and two greyish nodules in the lungs.

FEEDING (*Tabular summary*, page 255).

Two ponies were fed, one, No. 14, continuously for six days, receiving a total amount of 600 mg. of culture, the other, No. 4, with a single dose of 100 mg. The culture was administered in their drinking water.

Pony 14 was killed in good health after 138 days and showed tuberculous foci in a tonsil and in several cervical and mesenteric glands and a few tubercles in the lungs.

Pony 4 was killed after 160 days and was healthy except for two foci in the small intestine and one in a mesenteric gland in which no tubercle bacilli were found.

EXPERIMENTS ON RHESUS MONKEYS.

INOCULATION AND FEEDING EXPERIMENTS WITH CULTURES OF AVIAN TUBERCLE BACILLI.

Monkeys.

INTRAVENOUS (*Tabular summary*, page 251).

Seven rhesus monkeys were inoculated intravenously with cultures of avian tubercle bacilli in doses varying from 1 to 100 mg. Two, Nos. 154 and 160, died prematurely, and in one, No. 158, the inoculation was partly subcutaneous. The remaining four, Nos. 188, 190, 198, and 196, succumbed in 18, 26, 28, and 29 days respectively after doses differing so widely as 1 mg. and 100 mg. The disease was of the usual acute type without lesions of a definitely tuberculous character. The lungs were congested and oedematous, the spleen swollen, and the liver and kidneys pale. Smear preparations from the principal organs and some of the lymphatic glands showed numerous tubercle bacilli.

SUBCUTANEOUS (*Tabular summaries*, pages 250 and 258).

Five monkeys have been inoculated subcutaneously under the skin of the back, four with doses of 10 mg. each and one with 1 mg. Four were killed when well after periods varying from 113 to 140 days. Of these, two, Nos. 136 and 138, showed at the post-mortem examination nothing beyond a small ulcer or scar at the seat of inoculation; in one of the remaining two, No. 120, there were two tubercles in the lungs, and in the other, No. 134, there was a caseo-purulent nodule on the wall of the caecum containing numerous tubercle bacilli.

The fifth monkey, No. 118, was killed when very ill. The post-mortem examination revealed general tuberculosis, severe in the lungs, while at the seat of inoculation there was a smooth walled cystic tumour and only a single tubercle in an axillary gland on each side. This exceptional result is discussed in the report on modification experiments; it is sufficient to mention here that from the lung, spleen, and bronchial gland typical mammalian cultures, virulent for rabbits and guinea-pigs, were isolated, and from the local lesion cultures of both avian and mammalian tubercle bacilli were obtained.

Two monkeys, 192 and 194, were inoculated with emulsions of tuberculous material containing fairly numerous tubercle bacilli; they died after 55 and 51 days respectively and showed only local tuberculosis except for a single translucent tubercle in the lung of Monkey 192.

FEEDING (*Tabular summary*, page 255).

Five rhesus monkeys were fed with doses of culture varying from 1 to 500 mg. They were killed when well after from 112 to 151 days, and in none did the post-mortem examination show any definite tuberculous lesions.

Three were perfectly normal. In two, the mesenteric glands contained yellow purulent nodules, one nodule in Monkey 122 and two in Monkey 124; no tubercle bacilli could be demonstrated microscopically but cultures of avian tubercle bacilli were isolated in both cases.

EXPERIMENTS ON CATS.

INOCULATION EXPERIMENTS WITH CULTURES OF AVIAN TUBERCLE BACILLI AND A FEEDING EXPERIMENT WITH TUBERCULOUS TISSUES.

Cats.

(*Tabular summary*, pages 259–260.)

Three cats have been inoculated intravenously; two, Nos. 98 and 100, received, the former 1·0 mg. in the ear vein, the latter 0·1 mg. in the jugular vein of culture of Virus A X; the third, No. 102, was inoculated in the ear vein with 10 mg. of culture of Virus A VII.

Cat 98 died in 48 days; the body was emaciated and anæmic, but there were no tuberculous lesions visible. The microscopical examination of smear preparations showed a few tubercle bacilli in the lung and liver, none in the spleen, kidney, and bone-marrow.

Cat 100 was killed in poor condition, having lost a quarter of its original weight, 53 days after inoculation. The condition found at the post-mortem examination resembled that in Cat 98, but the tubercle bacilli were even more sparsely distributed in the tissues.

Cat 102 was killed 43 days after inoculation. The lungs did not collapse normally; there were patches of purulent broncho-pneumonia on the dorsal surfaces of the lungs, and scattered caseating miliary tubercles in the rest of the substance. There was slight caseation of the bronchial, mesenteric, and ileo-colic glands, but no disease elsewhere. Smear preparations from the lung, spleen, liver, and intestinal mucous membrane showed a few tubercle bacilli, and in the mesenteric glands they were moderately numerous.

By the intraperitoneal method, two kittens and two cats were inoculated. The two kittens (56 and 60) received doses of 1 mg. and 5 mg. respectively, and both died in 16 days; they showed at the post-mortem examinations slight omental thickenings, but no disease in the organs visible to the naked eye. Smear preparations showed that numerous tubercle bacilli were disseminated about the body.

One cat (96), inoculated with 1 mg., died after 69 days; the omentum was thickened and retracted, and except for patches of greyish-white foci (1 T.B. seen) in the lungs, all other organs and glands appeared normal. No tubercle bacilli could be demonstrated in smear preparations from the spleen, liver, and kidney.

The other cat (62) died in 73 days after 1 mg. It showed extensive disease of the omentum and peritoneum; the lymphatic glands were generally enlarged, but there were no tubercles visible in the organs. Smear preparations from the spleen, marrow, and inguinal gland showed numerous tubercle bacilli.

Three cats were inoculated subcutaneously with doses of 1 mg. and 10 mg.; two (54 and 92) died respectively in 14 and 49 days, and the third (64) was killed after 134 days. None developed any generalised tuberculosis.

One cat (94) was fed with the organs of a rabbit which had died after an intravenous inoculation of culture of avian tubercle bacilli. It was killed after 107 days in good condition; the post-mortem examination showed a few opaque foci in the Peyer's patches, and no disease elsewhere. A smear preparation from a mesenteric gland showed a few tubercle bacilli.

EXPERIMENTS ON GUINEA-PIGS.

INOCULATION AND FEEDING EXPERIMENTS WITH CULTURES OF AVIAN TUBERCLE BACILLI.

Guinea-pigs.

INTRAPERITONEAL (*Tabular summary*, pages 260–264).

Guinea-pigs frequently die after the intraperitoneal inoculation of avian tubercle bacilli; 34 guinea-pigs have been inoculated with doses of culture varying from 100 mg. to 0·01 mg.

All the guinea-pigs, seven in number, which received doses from 100 mg. to 5 mg., died after periods varying from 9 to 29 days.

With 1·0 mg. 19 guinea-pigs were inoculated and 14 died in from 19 to 64 days, the average duration of life being 40 days; the remaining 5 were killed in from 94 to 229 days.

After the inoculation of 0·1 mg. five out of seven guinea-pigs died in from 49 to 94 days and two were killed. One guinea-pig which received 0·01 mg. remained healthy.

The disease which causes the fatal result has fairly constant features.

The peritoneal tissue reaction varies in intensity with the size of the dose. After the larger doses the omentum becomes slightly thickened along the free margin by translucent tissue, and there may be a thin layer of easily detached fibrin on the visceral and parietal peritoneum; with the smaller doses discrete nodules filled with yellow pus are formed in the omentum. The spleen is enlarged and red and may show grey points beneath the capsule. The liver often contains minute irregular grey and yellowish grey necrotic foci. The kidneys are apparently normal. The lungs are usually oedematous and sometimes congested; occasionally there are pneumonic patches, especially in the anterior lobes, beset with opaque foci; sometimes the pleural cavities are filled with fluid. The lumbar and sternal glands are only slightly enlarged but usually opaque and softened; the other lymphatic glands, with the exception of the portal which may contain purulent foci, are normal. Smear preparations from the spleen and liver show moderately numerous tubercle bacilli, from the lungs less numerous, and none in the kidneys; tubercle bacilli are numerous in the softened sternal and lumbar glands.

If the animal recovers from the effects of the inoculation and is allowed to live for a long time the tubercle bacilli in the tissues are eliminated, and at the post-mortem examination there will be seen only purulent nodules in the omentum and sternal glands in which tubercle bacilli are numerous but dead.

SUBCUTANEOUS (*Tabular summary*, pages 264–268).

Guinea-pigs have been inoculated subcutaneously with doses of culture varying from 100 mg. to 0·1 mg. The large doses do not differ in their general effects from the small, and in no single instance has progressive tuberculosis been produced.

In all 36 guinea-pigs were inoculated. Of these, 20 were killed when well after periods varying from 113 to 229 days, and in no animal was there any extension of disease beyond the local lesion and the nearest glands. At the seat of inoculation there was either a purulent nodule in the subcutaneous tissues, or an ulcer in the skin with soft caseous substance beneath the margins, or, if the animal had lived a long time, merely a scar. The nearest lymphatic glands were enlarged and contained purulent nodules replacing a considerable part of the gland or purulent foci.

The remaining 16 animals died in periods varying from 11 to 127 days. They showed at the seats of inoculation and in the nearest glands, changes similar to those described above, and beyond these in the majority of cases no disease to account for death. In a few of the guinea-pigs there were visible in the liver minute grey or yellowish-grey foci, and an occasional tubercle bacillus was demonstrated in smear preparations from the organs. It is possible that the tubercle bacilli inoculated had some influence in causing the fatal results, owing to irritant or toxic effects of those bacilli which were disseminated, but there is little evidence in favour of this.

Cultures of avian tubercle bacilli which have retained their original characters after passage through various animals, have been inoculated subcutaneously into 12 guinea-pigs. The results were similar to those obtained with the cultures from the original material.

FEEDING (*Tabular summary*, page 269).

Guinea-pigs have been fed from a pipette with doses of culture varying from 10 mg. to 50 mg. They were killed, with the exception of one which died, after about 14 weeks, and seven out of eight showed no sign of tuberculosis. In the eighth there was only slight local tuberculosis in the form of a few opaque foci in the wall of the caecum and in an ileo-colic gland (T.B.), and small patches of caseation in the mesenteric glands.

INOCULATION EXPERIMENTS WITH TISSUE EMULSIONS.

(*Tabular summary*, pages 270–276.)

Emulsions have been made from the tissues of various animals inoculated with avian tubercle bacilli, and have been tested on guinea-pigs; in all, 155 guinea-pigs have been used, of which 97 were inoculated intraperitoneally and 58 subcutaneously.

The results do not differ from those obtained with culture; when the emulsions contained numerous tubercle bacilli the intraperitoneal inoculations caused death from subacute avian tuberculosis, and when there were only a few bacilli slight local tuberculosis resulted. In no instance after a subcutaneous inoculation was progressive tuberculosis produced.

The following is an analysis of the results of the 155 inoculations:—

After intraperitoneal inoculation 64 were killed in from 31 to 341 days: 17 were healthy, 40 showed local tuberculosis with occasionally slight affection of the nearest glands, and in 7 there was slight evidence of dissemination (focus in a rib, tubercles in the lungs, and foci in lymphatic glands). The remaining 33 died after periods varying from 9 to 143 days: of these 6 showed no obvious cause for death, 12 had local tuberculosis only, and 15 died of subacute avian tuberculosis.

After subcutaneous inoculation 40 were killed in from 28 to 108 days, and 18 died in from 20 to 151 days; of these 10 appeared healthy, and the remaining 48 with one exception had local tuberculosis only. The exception was G.P. 1962 (Virus AV), which had eight caseating nodules in the lungs and purulent nodules in the bronchial glands; a culture derived from a lung nodule was avian in type.

EXPERIMENTS ON GOATS.

INOCULATION AND FEEDING EXPERIMENTS WITH CULTURES OF AVIAN TUBERCLE BACILLI.

Goats.

INTRAVENOUS (*Tabular summary*, page 249).

Two goats, Nos. 58 and 56, were inoculated intravenously with 1 mg. and 10 mg. respectively, and died after 35 and 40 days. They succumbed to acute illness, such as occurs in calves and pigs after intravenous inoculations, in which the incidence of the disease is most marked in the lungs; these organs in both cases were heavy, congested, and oedematous. The other principal organs were apparently normal, but

Goats.

in smear preparations made from their substance tubercle bacilli were generally numerous.

SUBCUTANEOUS (*Tabular summaries*, pages 248 and 258).

Six goats were inoculated by the subcutaneous method with doses of culture varying from 10 mg. to 100 mg. Of these, five were killed in good health after from 98 to 154 days, and one, No. 48, was killed when very ill after 83 days. The post-mortem examination of four of the animals, which were killed when well, showed at the seat of inoculation in each case a softening caseous tumour and fairly extensive caseation of the nearest lymphatic glands. In one there were a few grey tubercles with caseo-calcareous centres and caseo-purulent nodules in the lungs, tubercles in the stomach and intestines, and in the mesenteric and other abdominal glands. The other three, Nos. 42, 44, and 54, showed scattered tubercles in the mesenteric, colic, and iliac glands.

The fifth goat, 36, had in addition to the local tuberculosis a few caseous nodules and grey tubercles in the lungs and several caseous nodules in the thoracic glands. From a lung nodule a mammalian culture resembling a bovine culture was isolated.

The goat, No. 48, which became very ill and was killed in a dying condition, was the youngest and, at the time of inoculation, was about five months old. It showed at the seat of inoculation a small ulcer and caseation of the adjacent prescapular gland. There were caseous patches in the portal, bronchial, and dorsal mediastinal glands. The lungs contained numerous irregular translucent nodules with yellowish centres, and tubercle bacilli were demonstrated in some of them (it was found by Dr. Eastwood that many of these nodules were due to a parasite of frequent occurrence in goats' lungs). Necrotic foci were visible in the liver. The Peyer's patches of the intestines were beset with small pits, and smear preparations showed masses of tubercle bacilli resembling pure culture. The mesenteric glands were enlarged, and the cortices were replaced by firm caseo-necrotic substance. Cultures made from the liver, the prescapular and mesenteric glands were avian in type.

A goat, No. 50, was inoculated with an emulsion of the liver of Calf 570 containing moderately numerous tubercle bacilli. When killed after 240 days, it showed local tuberculosis only.

FEEDING (*Tabular summary*, page 254).

Two goats, Nos. 34 and 38, were fed with 15 mg. and 100 mg. of culture respectively, and were killed after 132 and 110 days. They were in good condition, and the post-mortem examination revealed no generalised tuberculosis. There were a few foci in the intestine of one, and two nodules in the intestine of the other; the mesenteric, coeliac, and ileo-colic glands contained caseous gritty nodules.

Two kids, Nos. 62 and 64, aged 5 days respectively, were each fed with 60 milligrammes of culture of Virus A X. in milk through an artificial teat. They were killed in good general health 56 days later, and had gained in weight. There was no disseminated tuberculosis of the organs, but the tubercle bacilli had multiplied in the mucous membrane of the intestines, and had caused severe ulceration. The mesenteric and ileo-colic glands were enlarged and caseating, and there was slight tuberculosis of the tonsils, and of the portal, submaxillary, and posterior pharyngeal glands.

EXPERIMENTS ON RATS.

INOCULATION EXPERIMENTS WITH CULTURES OF AVIAN TUBERCLE BACILLI AND FEEDING EXPERIMENTS WITH TUBERCULOUS TISSUES.

(*Tabular summaries*, pages 277–281).

INTRAPERITONEAL.

Rats.

The results of the intraperitoneal inoculations of rats with avian tubercle bacilli resemble those following similar inoculations with bovine tubercle bacilli; with the former, however, the lesions in the peritoneal cavity are more numerous and larger.

Seventeen rats have been inoculated intraperitoneally with doses varying from 0·01 mg. to 200 mg. and the results are as follows:—

Rat 123, inoculated with 0·01 mg., was killed in good health after 574 days. There were a few bacilli in the spleen and none could be seen elsewhere, but cultures grew both from the liver and spleen.

Rat 124, inoculated with 0·1 mg., died after 173 days and showed no lesions; there were a few tubercle bacilli in the liver and spleen.

Six rats were inoculated, each with 1 mg. Of these, three showed nodules in the omentum and on the peritoneum and there were numerous tubercle bacilli in smear preparations from the liver, spleen, and mediastinal gland. One, killed after 109 days, had a moderate number of nodules in the omentum and moderately numerous tubercle bacilli in the spleen. A fifth, killed after 376 days, showed local tuberculosis and a few disseminated tubercle bacilli. The sixth, 133, was well when killed after 497 days; there were numerous peritoneal nodules and tuberculosis of the pelvic organs and a few tubercle bacilli in the spleen, liver, and kidney, from the former of which a culture was raised. It appears that after the inoculation of 1 mg. of culture either there may be a multiplication of tubercle bacilli in the organs or there may be formed local tuberculous nodules and in the organs only a few bacilli which, however, remain alive for a long time.

After the larger doses, varying from 10 to 200 mg., the rats may live a long time (247 days after 50 mg. and 131 days after 200 mg.) but except for a few cases the tubercle bacilli multiply and eventually cause death.

The post-mortem appearances have certain characteristic features. In the peritoneal cavity nodules filled with soft yellowish caseous substance are formed, the number depending on the amount of culture inoculated; sometimes there are fibrous translucent nodules, with or without calcareous granules in the centres. The testes and vesiculae seminales are enlarged and entirely composed of soft caseous substance. The organs may be apparently normal. More often the spleen is enlarged and firm, and shows grey points beneath the capsule. The lungs are slightly congested, but collapse well. The surface of the cortices of the kidneys is often pitted, and occasionally there is a caseous streak extending through the medulla.

SUBCUTANEOUS.

After a subcutaneous inoculation of very large doses of avian tubercle bacilli there is not the same multiplication of bacilli in the organs which occurs after intraperitoneal inoculations. At the seat of inoculation there may be a soft caseous nodule, a small ulcer or merely a scar; sometimes no local disease at all is discoverable. There is no caseation of the nearest lymphatic glands, but after large doses they contain numerous tubercle bacilli. A few tubercle bacilli may also be demonstrated in the spleen and liver, and in the case of two rats (Nos. 122 and 115) killed after 255 and 278 days respectively, cultures were grown from the spleen.

Fifteen rats were inoculated subcutaneously; eight died and seven were killed after periods varying from 13 to 290 days.

FEEDING.

Four rats were fed with the organs of a guinea-pig and a rabbit (which had died of acute avian tuberculosis), and when killed in from 113 to 265 days were found to be healthy. Smear preparations made from three rats showed no tubercle bacilli in the lung, spleen, liver, kidneys, and mesenteric gland.

In Rat 117, killed after 198 days, it was demonstrated that absorption and dissemination of tubercle bacilli had occurred, as moderately numerous bacilli were found in a mesenteric gland and a few in the spleen and kidney.

INOCULATION EXPERIMENT ON A CHIMPANZEE WITH CULTURE OF AVIAN TUBERCLE BACILLI.

(*Tabular summary*, page 250.)

Chimpanzee.

Chimpanzee 20 was inoculated under the skin of the back with 50 mg. of culture of Virus A II on May 22, 1906. It remained alive and well for nearly two years, when it succumbed to an attack of intestinal diarrhoea. The post-mortem examination showed no trace of tuberculosis and the only sign of the inoculation was a few scars in the skin of the back.

Four rabbits were inoculated with the culture at the same time as the chimpanzee and the results showed that the culture was in good condition.

INOCULATION EXPERIMENTS ON DOGS WITH CULTURES OF AVIAN TUBERCLE BACILLI.

(*Tabular summary*, page 282.)

Dogs.

Two dogs have been inoculated subcutaneously, each with 25 mg. of culture. One was killed after 74 days and showed at the seat of inoculation a fibrous walled cavity and slight enlargement of the nearest glands. There were a few grey points in the liver and one or two tubercles in the lungs in which tubercle bacilli were demonstrated microscopically.

The other died after 33 days without obvious cause. There was slight local tuberculosis and patches of broncho-pneumonia in the lungs in which no tubercle bacilli were seen. The bronchial glands were slightly swollen and smear preparations from them showed fairly numerous tubercle bacilli.

Four dogs (three puppies and one old dog) were inoculated intravenously with doses varying from 1·0 to 50 mg. and all were killed in good health in from 142 to 194 days. The post-mortem examinations showed that they were free from tuberculosis. Cultures were made from the liver, spleen, and kidney of the dog, No. 164, which was killed after 142 days, and colonies of tubercle bacilli grew from all, showing that bacilli were living in the tissues though incapable of setting up any lesions or of affecting the health of the animal. Since dogs have shown themselves insusceptible to avian tubercle bacilli inoculated by the most severe method and in relatively large doses, it has been considered unnecessary to test these animals by feeding or to repeat the subcutaneous inoculations.

TABULAR SUMMARIES OF INOCULATION AND FEEDING EXPERIMENTS ON FOWLS, PIGEONS, PARROTS, RABBITS, MICE, CALVES, PIGS, GOATS, CHIMPANZEE, RHESUS MONKEYS, HORSES, CATS, GUINEA-PIGS, RATS, AND DOGS, WITH AVIAN TUBERCLE BACILLI.

TABULAR SUMMARIES OF INOCULATION AND FEEDING EXPERIMENTS ON FOWLS, PIGEONS, PARROTS, AND MICE, WITH MAMMALIAN TUBERCLE BACILLI.

INTRAVENOUS INOCULATIONS OF FOWLS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM BIRDS.

Virus.	Source of Culture.	Number of Fowl.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
A. IV.	Original material (Liver of a pheasant).	108	—	—	August 22, 1906.	23 days old, 4th generation.	138 days	50·0 mg.	Died 35 days.	Lungs were a little oedematous. Liver and spleen pale. Kidneys normal. Smear preparations from the lung, spleen, and liver showed very numerous tubercle bacilli, a few in the kidney and bone-marrow.
A. II.	Original material (Spleen of a pigeon).	96	—	—	August 9, 1906.	29 days old, 6th generation.	148 days	10·0 mg.	Died 37 days.	Post-mortem appearances resembled the above. Very numerous tubercle bacilli in smears from the chief organs and bone-marrow. None in the blood.
A. IV.	Original material (Liver of a pheasant).	106	—	—	August 22, 1906.	23 days old, 4th generation.	138 days	10·0 mg.	Died 67 days.	Body emaciated and bloodless. Liver had the interlobular network well marked and contained two necrotic patches. Appearances otherwise resembled above. Swarms of tubercle bacilli in the spleen, numerous in the liver and lung, a few in kidney.
A. I.	Original material (Intestine of a touracou).	142	1,620	980	November 22, 1906.	22 days old, 8th generation.	280 days	1·0 mg.	Died 137 days.	Inoculation partly subcutaneous; caseo-necrotic tumour and ulcer at the seat of inoculation in left wing. Body emaciated. Spleen large and almost replaced by a mass of caseo-necrotic nodules. Liver speckled with irregular minute caseating tubercles. In the lungs, on the surface and in the substance, were scattered numerous yellowish grey nodules up to 2 mm. in diameter. Kidneys normal. Cervical glands on each side of neck caseous throughout. A miliary tubercle in the heart muscle and a few in the intestine. Necrotic nodules up to a wheat grain in size in the marrow of ribs and in the bones of the pelvis. Numerous tubercle bacilli in the cervical glands and marrow.
A. II.	Original material (Spleen of a pigeon).	94	—	—	August 9, 1906.	29 days old, 6th generation.	148 days	1·0 mg.	Died 30 days.	Result similar to that in Fowl 106. Very numerous tubercle bacilli in smears from spleen and liver; moderately numerous in lungs and kidney, and a few in the blood.
A. IV.	Original material (Liver of a pheasant).	104	—	—	August 22, 1906.	23 days old, 4th generation.	138 days	1·0 mg.	Died 35 days.	Organs, beyond a little pallor, appeared normal. Swarms of tubercle bacilli in the spleen; numerous in liver and lung, a few in kidney and bone-marrow.
A. VII.	Original material (Spleen of a fowl).	216	2,450	1,700	March 12th, 1907.	21 days old, 4th generation.	112 days	1·0 mg.	Died 33 days.	Spleen was enlarged and showed a few grey foci. Other organs appeared as in Fowl 106.
A. X.	Original material (Lung of a fowl).	258	1,600	800	May 30, 1907	21 days old, 4th generation.	121 days	1·0 mg.	Died 31 days.	Spleen was not enlarged but showed numerous grey points. Other organs normal. Swarms of tubercle bacilli in smear preparations from spleen and liver.
A. II.	Original material (Spleen of a pigeon).	92	—	—	August 9, 1906	29 days old, 6th generation.	148 days	0·1 mg.	Died 29 days.	Spleen was slightly enlarged and had a greyish mottled appearance. Liver pale; surface showed capillary congestion. Lungs oedematous. Kidneys normal.

A. VI.	Original material (Spleen of a pheasant).	**314**	1,350	780	September 21, 1907.	21 days old, 6th generation.	529 days	0·01 mg.	Died 45 days.	Body emaciated and bloodless. Spleen and liver pale. Lungs oedematous. Kidneys normal. Spleen swarming with tubercle bacilli, very numerous in liver, a few in kidney.
A. VIII.	Original material (Spleen of a fowl).	**376**	1,150	900	April 7, 1908	22 days old, 8th generation.	501 days	0·00001 mg.	Killed 94 days.	The spleen was enlarged and closely filled with yellow caseo-necrotic nodules. In the liver there were numerous discrete grey tubercles with opaque centres up to a millet seed. Lungs and kidneys normal.
A. VIII.	Original material (Spleen of a fowl).	**378**	1,220	970	April 7, 1908	22 days old, 8th generation.	501 days	0·000001 mg.	Killed 94 days.	In the spleen there was a moderate number of yellowish tubercles up to a millet seed. A few similar tubercles in the liver. Lungs and kidneys normal. No disease elsewhere.
A. VIII.	Original material (Spleen of a fowl).	**380**	1,420	980	April 7, 1908	22 days old, 8th generation.	501 days	0·0000001 mg.	Killed 94 days.	The spleen showed 12 necrotic nodules up to a hemp seed in size. A few scattered tubercles in the liver. Lungs and kidneys normal. No disease elsewhere.

INTRAVENOUS INOCULATIONS OF FOWLS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM SWINE.

Virus.	Source of Culture.	Number of Fowl.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
P. III.	Original material (Submaxillary gland of a pig).	**102**	—	—	August 22, 1906	23 days old, 21st generation.	561 days	10·0 mg.	Died 29 days.	The lungs were pink and crepitant but slightly oedematous; in the left there was a red patch of consolidation. Spleen and liver normal. Kidneys normal except for distension of left ureter. Very numerous tubercle bacilli in the smear preparations from the lungs, spleen, liver, and bone-marrow. A few in the kidneys.
P. III.	Original material (Submaxillary gland of a pig).	**100**	—	—	August 22, 1906	23 days old, 21st generation.	561 days	1·0 mg.	Died 33 days.	Lungs pinkish and crepitant. Spleen was enlarged and contained several yellow necrotic areas; the cut surface revealed on close inspection innumerable grey points which stood up slightly above the surface. Liver pale. Kidneys normal. Very numerous tubercle bacilli in smears from the liver, lung, spleen substance, bone marrow, and also in the kidney.
P. XXI.	Original material (Submaxillary gland of a pig).	**152**	1,520	980	November 22, 1906.	22 days old, 11th generation.	353 days	1·0 mg.	Died 42 days.	Lungs slightly congested and oedematous. Spleen greatly enlarged and peppered with irregular grey foci. Liver showed the interlobular network well marked and also a few grey necrotic patches. Kidneys and intestines normal. Smears from chief organs showed numerous tubercle bacilli.

INTRAVENOUS INOCULATIONS OF FOWLS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM SWINE—*continued.*

Virus.	Source of Culture.	Number of Fowl.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
P.XXVII.	Original material (Submaxillary gland of a pig).	**178**	1,220	870	January 7, 1907	67 days old, 8th generation.	392 days	1·0 mg.	Died 29 days.	Appearances resembled those in Fowl 102 except that there were a few foci visible in the spleen and the lungs were a little congested.
P. III.	Original material (Submaxillary gland of a pig).	**98**	—	—	August 22, 1906	23 days old, 21st generation.	561 days	0·1 mg.	Died 41 days.	Lungs slightly congested. Greyish white foci in the liver and spleen. Kidneys normal. Very numerous tubercle bacilli in the spleen and liver. A few in the lungs and none in the kidney.
P. III.	Original material (Submaxillary gland of a pig).	**348**	1,350	750	January 29 1908.	21 days old, 27th generation.	105 days	0·01 mg.	Died 54 days.	Lungs congested and oedematous contained sparsely scattered yellow miliary nodules. Spleen was enlarged and closely filled with grey tubercles with opaque centres. The liver was similar. Kidneys normal.
P. XLIV.	Original material (Submaxillary gland of a pig).	**172**	1,300	720	January 4, 1907	22 days old, 5th generation.	189 days	0·01 mg.	Died 56 days.	Body very emaciated and pale. Lungs congested and oedematous. Spleen large 3·2 by 2·2 by 1·5 cm.: it and the liver resembled those of Fowl 348. Kidneys dark, otherwise normal.
P. III.	Original material (Submaxillary gland of a pig).	**346**	1,200	840	January 29, 1908.	21 days old, 27th generation.	105 days	0·001 mg.	Died 97 days.	Lungs congested and oedematous contained a few necrotic nodules up to about a hemp seed. The spleen 3·7 by 2 by 2·5 cm. was almost replaced by necrotic nodules. The liver was large and closely filled with necrotic miliary nodules. Kidneys normal. Tubercles in the intestinal wall and in the bone-marrow of the ribs.

INTRAPERITONEAL INOCULATIONS OF FOWLS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM BIRDS.

A. II.	Original material (Spleen of a pigeon).	**212**	1,300	720	March 1, 1907	20 days old, 9th generation.	352 days	10·0 mg.	Died 67 days.	Animal greatly emaciated. Necrotic bean-sized nodule in subcutaneous tissue. Visceral peritoneum partly uniformly thickened, partly covered with numerous tubercles. Peritoneum over gizzard and mesentery were thickened and enclosed layers of yellow necrotic substance. Spleen enlarged 2·0 by 1·3 cm. was packed with grey tubercles with necrotic centres the size of rape seed. Liver showed numerous minute grey tubercles, a few opaque in the centre. Lungs congested and oedematous; on the left side there was a layer of necrotic substance on the lung, and extending into it, and in the substance of that lung were moderately numerous miliary tubercles. Kidneys and cervical glands normal.

A. VII.	Original material (Spleen of a fowl).	218	1,850	900	March 12, 1907	2 days old, 4th generation.	112 days	10·0 mg.	Died 70 days.	Necrotic tumour the size of a pigeon's egg in the subcutaneous tissue. Moderately severe peritoneal tuberculosis. The spleen and liver contained numerous tubercles. Two grey miliary tubercles with opaque centres in the lungs. Kidneys normal, opaque tubercles in the cervical glands.
A. X.	Original material (Lung of a fowl).	260	2,080	1,000	March 30, 1907	21 days old, 4th generation.	121 days	10·0 mg.	Killed 174 days.	The intestines were enclosed in a bag formed by fibrous tissue infiltrated with yellow necrotic substance. The oviducts had become obstructed and contained several dried yolks. Spleen and liver showed moderately numerous tubercles, none in the lungs or kidneys.
A. VI.	Original material (Spleen of a pheasant).	312	1,620	1,220	January 29, 1908.	21 days old, 6th generation.	529 days	0·1 mg.	Died 207 days.	Firm yellow necrotic tumour in subcutaneous tissue. On the visceral and parietal peritoneum there were moderately numerous tubercles and flattened nodules, some translucent and others opaque. Spleen greatly enlarged was almost entirely necrotic and yellow. Numerous caseating tubercles in the liver. A few minute tubercles in the lungs. Cervical glands caseous. Caseous tubercles in the bone marrow of ribs, pelvic bones, and head of femur. Joints normal. Kidneys normal.
A. X.	Original material (Lung of a fowl).	384	1,100	600	May 21, 1908	12 days old, 11th generation.	478 days	0·1 mg.	Died 50 days.	In the pelvis there was a flattened caseo-necrotic mass. The intestines, mesentery and peritoneal ligaments were closely covered with flat grey tubercles with opaque centres. The liver and spleen contained moderately numerous caseating tubercles up to 0·5 mm. in diameter. Lungs and kidneys normal.
A. X.	,,	382	2,400	1,270	May 21, 1908	12 days old, 11th generation.	478 days	0·01 mg.	Died 46 days.	The mesentery was thickened by a layer of yellowish caseous tissue and there were layers of a similar substance on the gizzard and parts of the intestines. The spleen and liver showed fairly numerous grey tubercles. In the lungs there were a few grey tubercles with opaque centres. Kidneys normal.
A. X.	,,	390	1,390	1,700	May 21, 1908	12 days old, 11th generation.	478 days	0·0001 mg.	Killed 50 days.	The animal was fat and in good condition. On the peritoneal ligaments there were moderately numerous caseating tubercles up to a millet seed in size. Mesentery and intestines normal. There was one caseating tubercle in the liver and from six to eight in the spleen, the size of rape seed. There were fairly numerous caseating miliary tubercles in the lungs. Kidneys normal.
A. X.	,,	388	1,250	1,200	May 21, 1908	12 days old, 11th generation.	478 days	0·00001 mg.	Killed 50 days.	Condition good. A few minute transparent tubercles on the peritoneal folds. In the spleen there were six grey nodules with yellow central foci up to a millet seed in size. The liver contained seven smaller tubercles. There were three minute grey tubercles in the lungs. Kidneys normal.
A. X.	,,	386	1,250	1,350	May 21, 1908	12 days old, 11th generation.	478 days	0·0000001 mg.	Killed 50 days.	The animal was fat and in good condition, and there was no sign of tuberculosis.

INTRAPERITONEAL INOCULATIONS OF FOWLS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM SWINE.

Virus.	Source of Culture.	Number of Fowl.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
P. II.	Original material (Submaxillary gland of a pig).	164	1,000	700	November 28, 1906.	23 days old, 26th generation.	629 days	10·0 mg.	Died 61 days.	Body extremely emaciated ; skin, mucous membrane, beak, etc., pale. On the parietal peritoneum there was a greyish-white membrane, readily stripping off, with yellow caseous patches beneath ; the visceral peritoneum was thickened, and beneath it, most marked on the gizzard, were layers of yellow necrotic substance. The mesentery was thickened and enclosed similar necrotic layers. The spleen was moderately enlarged and closely filled with minute grey tubercles with central opacities. Liver closely filled with grey foci and minute caseating tubercles. Lungs a little congested and oedematous. Kidneys normal. Smears from peritoneum and lung showed numerous tubercle bacilli, a few in kidney.
P. II.	Original material (Submaxillary gland of a pig).	160	1,120	720	November 28, 1906.	23 days old, 26th generation.	629 days	1·0 mg.	Died 40 days.	Body extremely emaciated and pale. The visceral and parietal peritoneum were closely covered with translucent tubercles with yellow centres confluent on the gizzard ; mesentery and mesocolon thickened and enclosing a layer of yellow necrotic substance. Spleen 2 by 1·3 cm. on section ; it showed numerous tubercles from a point up to a rape seed. Liver closely filled with caseating tubercles up to 0·5 mm. Lungs congested and oedematous. Kidneys normal. Spleen and liver showed numerous tubercle bacilli in smear preparations.
P. XXI.	Original material (Submaxillary gland of a pig).	150	1,090	690	November 22, 1906.	22 days old, 11th generation.	353 days	1·0 mg.	Died 75 days.	Body emaciated and pale. Numerous discrete tubercles on the visceral and parietal peritoneum. Between the breast bone and liver there was a mass of yellow necrotic substance enclosed in a thin fibrous capsule. Spleen and liver were closely filled with grey tubercles with yellow centres. Lungs congested and oedematous. Kidneys normal.
P.XXVII.	Original material (Submaxillary gland of a pig).	180	1,500	720	January 7, 1907	67 days old, 8th generation.	392 days	1·0 mg.	Died 173 days.	Numerous flattened yellowish tubercles in the mesentery, on the visceral peritoneum and on the gizzard. Numerous quite transparent tubercles on the peritoneal ligaments. Spleen showed numerous irregular yellow tubercles up to a rape seed. An occasional tubercle in the liver. A yellow focus in a lung. In the cervical glands there were numerous yellow necrotic nodules. Kidneys, intestines, and joints normal.
P. XLIV.	Original material (Submaxillary gland of a pig).	174	1,020	600	January 4, 1907	22 days old, 5th generation.	189 days	1·0 mg.	Died 76 days.	Body emaciated. Moderately severe peritoneal tuberculosis. Spleen 1·5 by 1·0 by 0·6 cm. contained numerous tubercles the size of rape seed with yellow centres. Moderately numerous similar tubercles in the liver. In one lung there were two minute grey tubercles. Kidneys normal.

SUBCUTANEOUS AND INTRA-MUSCULAR INOCULATIONS OF FOWLS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM BIRDS.

A. I.	Original material (Intestine of a touracou).	**144**	1,000	650	November 22, 1906.	22 days old, 8th generation.	280 days	10·0 mg.	Died 47 days.	The body was extremely emaciated, and in the position of the right breast muscles, which had disappeared, there was a yellow caseated tumour 5 by 3·8 by 1·8 cm. Spleen was enlarged and closely packed with tubercles, the size of rape seed, grey with yellow necrotic centres. Numerous tubercles in the liver, varying from a point up to 0·5 mm Lungs a little congested and oedematous. Scattered minute grey tubercles in the kidneys. Numerous tubercle bacilli in smears from the lung, liver, spleen, kidney, and local tumour.
A. II.	Original material (Spleen of a pigeon).	**210**	1,040	530	March 1, 1907	20 days old, 9th generation.	352 days	10·0 mg.	Died 133 days.	Body extremely emaciated. Yellow necrotic tumour in the hollow of the breast. Spleen measured 3·2 by 2·2 cm. and was closely filled with irregular yellow necrotic nodules. Moderately numerous minute grey tubercles in the liver. In the lungs there were sparsely scattered yellowish tubercles up to a rape seed. Kidneys normal. Cervical glands replaced by necrotic masses. A few tubercles in the walls of the caeca and duodenum. Smear from a cervical gland showed numerous tubercle bacilli, from the liver a few.
A. III.	Original material (Lung of a demoiselle crane).	**200**	1,550	700	February 6, 1907.	22 days old, 4th generation.	315 days	10·0 mg.	Died 101 days.	Flattened yellow tumour 12 by 6 cm. and 5 mm. in greatest thickness. Spleen 2·3 by 1·7 cm. packed with grey tubercles with opaque centres the size of rape-seed. Liver showed numerous similar tubercles. In each lung there were two or three miliary tubercles. Kidneys normal. Necrotic nodules in the cervical glands.
A. VII.	Original material (Spleen of a fowl).	**220**	1,300	820	March 12, 1907	21 days old, 4th generation.	112 days	10·0 mg.	Died 47 days.	The post-mortem appearances were similar to those in Fowl 144, except that there were a few tubercles in the lungs, and the kidneys were normal. The spleen measured 3·5 by 2·4 by 1·5 cm.
A. X.	Original material (Lung of a fowl).	**256**	2,050	1,250	May 30, 1907	21 days old, 4th generation.	121 days	10·0 mg.	Died 44 days.	Caseo-necrotic mass in left breast muscle. Numerous tubercles in the liver and spleen. Kidneys normal. A single tubercle in the lungs. Neck glands normal.
A. VI.	Original material (Spleen of a pheasant).	**310**	1,400	1,050	September 21, 1907.	21 days old. 6th generation.	529 days	1·0 mg.	Died 79 days.	Body emaciated. Yellow necrotic tumour under skin of right breast. The peritoneal cavity was filled with blood. The liver was large and soft and there was a fissure in the left lobe from which the hæmorrhage had occurred; in the substance there were numerous tubercles up to a millet seed. Spleen measuring 2·8 by 1·6 by 1·4 cm. was closely filled with grey tubercles with necrotic centres. Four tubercles in the lungs. Kidneys pale. Cervical glands enlarged contained necrotic tubercles.
A. VIII.	Original material (Spleen of a fowl).	**252**	2,150	1,850	May 28, 1907	21 days old, 4th generation.	186 days	1·0 mg.	Killed 254 days.	Minute ulcer in skin. Flattened yellow tumour 3·5 cm. in diameter in subcutaneous tissue. The spleen contained moderately numerous tubercles up to a millet seed. Four minute caseating tubercles in the liver. In the lungs there were five tubercles up to a millet seed with opaque centres. Kidneys normal.
A. VII.	Original material (Spleen of a fowl).	**222**	950	560	March 12, 1907	21 days old, 4th generation.	112 days	0·01 mg.	Killed, dying 183 days.	Bright yellow necrotic tumour in subcutaneous tissue of breast and small ulcer in skin. The liver was large and filled with nodules varying up to a pea in size, the largest yellow and necrotic in the centre. The spleen was small but irregular in outline from the presence of numerous similar nodules. An occasional tubercle in the lungs, and one in the heart muscle. Kidneys normal. Cervical glands caseous.

SUBCUTANEOUS AND INTRA-MUSCULAR INOCULATIONS OF FOWLS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM BIRDS—*continued.*

Virus.	Source of Culture.	Number of Fowl.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
A. VIII.	Original material (Spleen of a fowl).	250	2,220	1,020	May 28, 1907	21 days old, 4th generation.	186 days	0·01 mg.	Killed 254 days.	In the subcutaneous tissue there was a flat necrotic tumour 4 by 3 cm. and a few small nodules around it. In the spleen there were twelve nodules up to a millet seed. In the liver there were sparsely scattered nodules up to a pea in size. The lungs showed four nodules from a rape seed up to a pea. Kidneys normal. On the intestines and the mesentery there were numerous tubercles, some minute and transparent, others flattened, opaque, and about the size of millet seeds. In the oviducts there were seven inspissated yolks varying in size up to a sparrow's egg. In the ovary there was a nodule composed entirely of yellow necrotic tissue. A smear from the yolk of one of the dried eggs showed numerous tubercle bacilli (long and beaded) and it is evidently from this source that the peritoneum became infected.
A. VIII.	Original material (Spleen of a fowl).	248	1,420	620	May 28, 1907	21 days old, 4th generation.	186 days	0·0001 mg.	Died 190 days.	Body extremely emaciated. Under the skin of breast there was a tumour 6·5 by 1·5 by 0·4 cm. and a few nodules around composed of necrotic substance. Spleen small but irregular and beset with numerous necrotic tubercles. Moderately numerous nodules in the liver varying up to a pea in size. An irregular necrotic tubercle in each lung. Kidneys and intestines normal.
A. VIII.	Original material (Spleen of a fowl).	246	1,720	1,270	May 28, 1907	21 days old, 4th generation.	186 days	0·000001 mg.	Killed 254 days.	A flat yellow nodule 4 mm. in diameter on the muscle of the right breast. Spleen contained about fifteen nodules, the largest 6 mm. in diameter, and scattered grey tubercles. In the liver there were sparsely scattered tubercles up to a millet seed. Lungs, kidneys, large and small intestines normal. In the wall of each caecum there were two or three nodules the size of peas; the mucous membrane over them was intact. A necrotic nodule in a cervical gland nearest the local lesion.
A. VIII.	Original material (Spleen of a fowl).	244	2,220	2,200	May 28, 1907	21 days old, 4th generation.	186 days	0·0000001 mg.	Killed 254 days.	Animal fat and in good condition. There was no local lesion visible at the seat of inoculation. Spleen contained moderately numerous yellow nodules the size of rape-seed. Four tubercles in the liver. Lungs, kidneys, cervical glands, intestines, and caeca normal.

SUBCUTANEOUS AND INTRA-MUSCULAR INOCULATIONS OF FOWLS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM SWINE.

Virus.	Source of Culture.	Number of Fowl.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
P.XXVII.	Original material (Submaxillary gland of a pig).	182	1,320	1,000	January 7, 1907.	67 days old, 8th generation.	392 days	100·0 mg.	Died 64 days.	Body emaciated and pale. In the subcutaneous tissue of the breast there was a flattened tumour 9 by 6 by 1·2 cm. adherent to muscle and skin in which there was a small ulcer; it was composed of bright yellow necrotic substance within a fibrous capsule and with a central cavity containing fluid and yellow flakes. Spleen measured 3·8 by 2·8 by 2 cm. and was closely filled with nodules varying up to 1·5 mm. Liver was large and filled with nodules varying up to 2·5 mm.; the nodules consisted of yellow caseo-necrotic substance within thin grey capsules. Lungs contained two miliary tubercles. Kidneys normal.

P. XXI.	Original material (Submaxillary gland of a pig).	184	1,710	820	January 8, 1907.	19 days old, 14th generation.	400 days	20·0 mg.	Died 145 days.	In the subcutaneous tissue of the breast there was a yellow necrotic tumour 7 by 6 by 1 cm., breaking down in the centre; it was adherent to muscle and to skin which was ulcerated and covered with a scab. Spleen 4 by 3 by 2·8 cm. was almost replaced by confluent yellow necrotic masses. In the liver there were fairly numerous discrete nodules up to 1·5 mm., the largest irregular and necrotic in the centre. In the lungs there were moderately numerous discrete nodules ranging up to a pea in size: several projected and adhered to chest wall. A submiliary tubercle in one kidney. Numerous necrotic nodules in cervical glands on both sides, in the marrow of ribs, in pelvic bones and heads of long bones. A few projecting nodules in the intestinal wall.
P. II.	Original material (Submaxillary gland of a pig).	162	1,180	650	November 28, 1906.	23 days old, 6th generation.	629 days	10·0 mg.	Died 61 days.	Body very emaciated; feathers fallen out. Necrotic tumour 5 by 2·5 by 0·8 cm. in left breast: small ulcer in skin. Spleen closely filled with tubercles up to 0·5 mm. and liver with tubercles up to 1 mm.; they consisted of yellow necrotic substance within thin translucent capsules. Lungs, kidneys, &c. normal. There were moderately numerous tubercle bacilli in smear preparations from both the capsule and the centre of a liver tubercle.
P. XXI.	Original material (Submaxillary gland of a pig).	148	1,180	670	November 22, 1906.	22 days old, 11th generation.	353 days	10·0 mg.	Died 71 days.	Body extremely pale and emaciated. Necrotic yellow tumour arranged in laminæ. Spleen enlarged and filled with rape seed sized tubercles. Numerous tubercles in the liver up to 1 mm. Yellow nodules on the right pleura; lungs oedematous, otherwise normal. Kidneys normal.
P. II.	Original material (Submaxillary gland of a pig).	158	1,220	620	November 28, 1906.	23 days old, 6th generation.	629 days	1·0 mg.	Died 108 days.	Flattened tumour 5 by 3 cm. adherent to and infiltrating breast muscle. Spleen was enlarged, measuring 3·5 by 2·5 by 2 cm., and was closely filled with irregular necrotic nodules. Liver was closely filled with similar nodules up to 4 mm. Lungs oedematous, they showed moderately numerous tubercles up to 2 mm. in diameter. A grey tubercle 0·5 mm. in each kidney. A hemp seed nodule in the small intestine and a few in the caeca up to a millet seed.

FEEDING EXPERIMENTS ON FOWLS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM BIRDS.

A. I.	Original material (Intestine of a touracou).	146	1200	920	April 2nd, 1908	22 days old, 5th generation.	280 days	10·0 mg.	Died 131 days.	The mucous membrane of the larynx was ulcerated and the lumen was blocked with yellow necrotic substance; it was adherent to the pharynx. Numerous nodules in the mucous membrane of pharynx; a few in the œsophagus and small intestine. Moderately numerous tubercles up to a millet seed in size in the spleen and liver. One opaque tubercle in the lungs. Kidneys normal. In the breast bone and marrow there were two pea sized caseous nodules. The chain of glands on the left side of the neck was caseous throughout and surrounded by oedema. Smears made from the bone marrow of the tibia in which there were no tubercles visible contained tubercle bacilli.

FEEDING EXPERIMENTS ON FOWLS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM BIRDS—*continued.*

Virus.	Source of Culture.	Number of Fowl.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
A. II.	Original material (Spleen of a pigeon).	214	950	430	March 1st, 1907	20 days old, 5th generation.	352 days	10·0 mg.	Died 201 days.	The mucous membrane of the larynx was studded with nodules from which projected yellow necrotic masses almost obliterating the lumen. In the pharynx, œsophagus and crop there were about 20 irregular necrotic nodules up to a hemp seed in size. The proventriculus showed numerous necrotic nodules both in the mucous membrane and in the glandular tissue. Gizzard normal. Beneath the mucous membranes of the small intestine, the large intestine and the caeca there were numerous nodules up to a wheat grain; Peyer's patches were thickened, caseous and projected on the peritoneal surface. Liver and spleen showed numerous yellow necrotic nodules up to 4 mm. In the lungs there were seven necrotic nodules. Cervical glands caseous throughout. Joints normal. The heads of both femurs and the pelvic bone contained caseous nodules.
A. VII.	Original material (Spleen of a fowl).	224	1,850	630	March 12, 1907	21 days old, 4th generation.	112 days	10·0 mg.	Died 170 days.	There were yellow necrotic nodules in the pharynx, on the tongue and in the oesophagus, crop, proventriculus, small and large intestines, Peyer's patches and caecal glands. The mucous membrane of the larynx was covered with yellow necrotic substance, and there were several flattened tubercles in the trachea. The spleen and liver were closely filled with yellowish tubercles up to 2 mm. Lungs congested; they contained each about twelve necrotic nodules up to a wheat grain. Kidneys normal. Joints normal but there were yellow necrotic nodules in the heads of the bones as well as in the ribs and the pelvic bones. Numerous tubercle bacilli in smears from the pelvis, femur and humerus.

FEEDING EXPERIMENTS ON FOWLS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM SWINE.

Virus.	Source of Culture.	Number of Fowl.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
P. II.	Original material (Submaxillary gland of a pig).	32	—	—	March 28, 1906	21 days old, 21st generation.	384 days	The growth from two glycerin serum tubes (about 20·0 mg.).	Died 107 days.	The mucous membrane of the larynx was thickened and yellowish in colour. In the upper third of the trachea there were numerous flattened yellowish grey tubercles, the largest 2 mm. Two grey nodules with yellow foci in the pharynx and one in the oesophagus ulcerated in the centre. Crop normal. Cervical glands were enlarged and several showed yellow foci. In the glandular enlargements of proventriculus there were ulcerated necrotic nodules. Moderately numerous yellow tubercles beneath the mucous membrane of the small intestine; necrotic nodules projecting from ulcers in the Peyer's patches. Numerous tubercles in the large intestine. Spleen was enlarged and contained moderately numerous grey nodules up to 2 mm. in diameter with yellow centres. Sparsely scattered smaller nodules in the liver. One grey tubercle the size of a rape seed in the lungs. Kidneys normal. Smears from the larynx and post-pharyngeal gland showed numerous tubercle bacilli, a few in the oesophagus.

P. II.	Original material (Submaxillary gland of a pig).	34	—	—	March 28, 1906	21 days old, 21st generation.	384 days	The growth from two glycerin serum tubes (about 20·0 mg.).	Killed 140 days.	The mucous membrane of the larynx was replaced by reddish granulation tissue beset with yellow necrotic granules. Numerous flat translucent tubercles, opaque in the centre, down the trachea and in the pharynx. The glandular tissues at the end of oesophagus and in the proventriculus were enlarged and beset with opaque foci. In the small intestine there were numerous sub-mucous miliary nodules projecting through ulcers in the mucous membrane. The Peyer's patches were swollen, firm, and beset with yellow foci. The large intestine was congested and studded with nodules up to a wheat grain. Several of the cervical glands contained caseous nodules. Three irregular tubercles the size of rape seed in the spleen. Sparsely scattered grey foci in the liver. Lungs, kidneys, testes, heart and joints normal. Smear from larynx showed numerous tubercle bacilli.
P. III.	Original material (Submaxillary gland of a pig).	36	—	—	March 28, 1906	21 days old, 17th generation.	384 days	The growth from one glycerin serum tube (about 10·0 mg.).	Died 96 days.	The larynx was obstructed by yellowish friable substance with offensive odour. The pharynx, oesophagus and lymphoid tissue of small intestine showed numerous yellow granules; in the rectum there were similar necrotic foci in the mucous membrane. In the liver and spleen there were moderately numerous tubercles up to a millet seed in size. Other organs and glands normal. Smear preparations showed a few tubercle bacilli in larynx and spleen nodules, numerous in the necrotic granules from the pharynx, small intestine and rectum.
P. XXI.	Original material (Submaxillary gland of a pig).	26	—	—	February 19, 1906.	21 days old, 4th generation.	77 days	10·0 mg.	Killed 92 days.	The lymphoid tissue of the proventriculus contained grey nodules with soft yellow foci. Numerous grey nodules in the small intestines with small ulcers from which yellow substance projected. The Peyer's patches were thickened and beset with small apertures on the mucous surfaces from which yellow necrotic substance protruded. The lymphoid nodules of the caeca resembled the Peyer's patches. The spleen and liver contained moderately numerous yellowish grey tubercles up to about 1·5 mm. in diameter. Lungs, heart, and kidneys normal.
P. XXI.	Original material (Submaxillary gland of a pig).	28	—	—	February 19, 1906.	21 days old, 4th generation.	77 days	10·0 mg.	Died 103 days	At the base of the tongue, on the roof of the mouth, and in the pharynx and along the oesophagus there were in all fourteen grey miliary nodules with opaque foci. The lymphatic tissue in the proventriculus contained canary yellow foci. The small intestine was studded with numerous yellowish nodules up to 3 mm. in diameter without ulceration. The Peyer's patches were composed of thick translucent tissue beset with yellow streaks and foci; they were hollowed and ulcerated internally and projected on the serous surface as rounded nodules up to 5 mm. in length. The mucous membrane of the large intestine was beset with nodules similar to the above. Opaque focus in one cervical gland. Liver large and very soft; substance filled with caseating tubercles up to 1·5 mm. Moderately numerous tubercles in the spleen. Lungs, heart, and kidneys normal. Numerous tubercle bacilli in cervical gland and lymphoid tissue of the proventriculus.
P. XXVII.	Original material (Submaxillary gland of a pig).	46	—	—	March 30, 1906	21 days old, 5th generation.	109 days	The growth from one glycerin serum tube (about 10·0 mg.).	Died 63 days.	Body very fat, cause of death not obvious. In the lymphoid tissue of the proventriculus and of the first Peyer's patch which was thickened there were yellow foci. On the mucous membrane of the intestine there were scattered yellowish white foci easily scraped away. Follicles of large intestine contained secretion. A few greyish white tubercles in the liver. Spleen, lungs, and kidneys normal. Smear preparations from the foci of proventriculus and intestines contained a few T.B.; from Peyer's patch numerous.

FEEDING EXPERIMENTS ON FOWLS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM SWINE—*continued.*

Virus.	Source of Culture.	Number of Fowl.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
P. XLIV.	Original material (Submaxillary gland of a pig).	**176**	1,180	920	January 4, 1908	22 days old, 5th generation.	189 days	10·0 mg.	Died 202 days.	Caseous nodules and ulcers in the pharynx, larynx, oesophagus, crop and proventriculus. Several cervical glands replaced by yellow necrotic substance. Along the large and small intestine were moderately numerous caseous nodules with small ulcers varying from a rape seed to a split pea; the first Peyer's patch was large and caseating, it measured 1 by 0·5 cm., and was ulcerated internally and projected on the serous surface. Spleen and liver were enlarged and showed numerous yellow caseous nodules up to a pea in size. Two tubercles in the lungs and a few on the mesentery. Kidneys, heart, and joints normal.

FEEDING EXPERIMENTS ON FOWLS WITH EMULSIONS OF TUBERCULOUS MATERIAL (AVIAN.

INCLUDING A SERIES FED WITH EQUIVALENT DOSES AND KILLED AT INTERVALS.

Virus.	Material used.	Number of Fowl.	Weight in Grammes.		Date of Inoculation.	Dose.	Duration of Life.	Result.
			Initial.	Final.				
A. VIII.	Organs of Rabbits 1351, 1352. (Intraperitoneal and intravenous inoculations).	**266**	2,000	1,400	June 19, 1907	Equivalent Doses.	Killed 70 days	Condition fair. Tongue, pharynx, oesophagus crop, and cervical glands normal. In the mucous membrane of the larynx there were bright red congested foci. In the proventriculus there was a yellow rape seed nodule. Gizzard normal The Peyer's patches and follicles of the small intestine were a little firm. The spleen and liver showed moderately numerous caseating tubercles up to 0·5 mm. in diameter. Kidneys normal. Lungs a little congested. Joints normal. Smears from proventriculus (nodule), small intestine (mucous membrane), and Peyer's patch showed moderately numerous tubercle bacilli; two T.B. in the larynx.
A. VIII.	Organs of Rabbits 1351, 1352.	**270**	1,380	540	June 19, 1907		Killed 98 days	Condition poor. In the mouth, pharynx, and oesophagus there were moderately numerous caseating tubercles. Crop normal. Opaque foci in glands of proventriculus. In the mucous membrane of small intestines there were sparsely scattered tubercles up to 1·5 mm.: the Peyer's patches were thickened, grey and beset with necrotic foci; they were slightly concave on the internal surface and projected peritoneally. Opaque miliary nodules in the caeca and large intestine. Larynx congested, trachea normal. In the spleen and liver there were scattered caseous nodules up to a millet seed. In the lungs there were four submiliary tubercles. Kidneys normal. Joints normal Necrotic nodules in the cervical glands

A. VIII.	Organs of Rabbits 1351, 1352.	272	1,470	900	June 19, 1907	Equivalent Doses.	Killed 126 days	Condition fair. Two grey nodules with yellow centres in the pharynx, one on the tongue; a few foci in the trachea. Crop and gizzard normal. A few necrotic nodules in the glandular tissue of the proventriculus. The Peyer's patches were thickened and composed of firm grey tissue infiltrated with necrotic substance; they were ulcerated and hollowed out internally and formed prominent projecting nodules on the peritoneal surface, the largest measuring 2·2 by 1·5 by 0·7 cm.; the mucous membrane of the small and large intestines and the caeca showed numerous grey nodules with necrotic centres up to a wheat grain in size. Moderately numerous caseous miliary nodules in the liver and a few minute tubercles in the spleen. The lungs contained discrete necrotic nodules up to 2·5 mm. in diameter. Heart, joints, and kidneys normal. Yellow necrotic nodules in the bone marrow of femur, and a rib.
A. VIII.	Organs of Rabbits 1351, 1352.	268	1,750	1,750	June 19, 1907		Killed 154 days	Condition poor. A few nodules in the pharynx, on the tongue, and mucous membrane of larynx. The glands of the proventriculus were beset with yellow foci. Crop normal. The mucous membrane of the small and large intestines was beset with yellow tubercles the size of rape seed. The Peyer's patches were thickened and projected as tumours on the peritoneal surface. There was a peritoneal nodule the size of a pea connected by a narrow neck to the intestine. Necrotic tubercles in cervical glands. Moderately numerous tubercles in the liver and spleen up to 2 mm. and in the lungs up to 3·5 mm. Caseous tubercles in heads of a tibia and femur.
A. VIII.	Organs of Rabbits 1351, 1352.	274	1,450	1,020	June 19, 1907		Died 173 days	In the pharynx there were twenty caseous nodules up to a hemp seed, a few in the oesophagus, and one in the crop. Tongue, larynx, and trachea normal. Cervical glands contained caseo-necrotic nodules. Two nodules in the gizzard. The mucous membrane of the small and large intestines was beset with numerous nodules varying up to a wheat-grain in size. The Peyer's patches formed prominent nodules on the peritoneal surface, the largest 1·1 by 1·5 by 0·7 cm., and the glandular tissue of the caeca was similar. Spleen and liver contained numerous caseating tubercles up to a hemp seed. Similar nodules sparsely scattered in the lungs. A single tubercle in the left kidney. A necrotic nodule in the head of each femur.
A. X.	Organs of Rat 134	264	1,620	1,150	June 11, 1907		Killed 162 days	A few caseous nodules and foci in the pharynx, larynx, and glands of proventriculus, and in the cervical lymphatic glands. Oesophagus, crop, and gizzard normal. The Peyer's patches were represented by nodules projecting peritoneally and with constricted attachments to the intestine: the largest measured 2 by 1·3 cm. Scattered tubercles in the mucous membrane of small and large intestines and caeca. Moderately numerous necrotic nodules in the spleen and liver. A single nodule 8 by 4 mm. in the lungs. Kidneys and joints normal. A pea-sized nodule in each of two ribs expanding the bone.
A. I.	Lung of a Senegal touracou.	22	—	—	February 16, 1906	2·0 cc.	Killed 91 days	There was a small greyish body in the spleen pulp. No tubercle bacilli found. No tuberculosis elsewhere.
A. I.	Lung of a Senegal touracou.	24	—	—	February 16, 1906	2·0 cc.	Killed 91 days	Spleen contained two tubercles. In the liver, just beneath the capsule, there were four grey tubercles with opaque centres. No tuberculosis elsewhere. Smear preparations from the liver tubercles showed fairly numerous tubercle bacilli; from the spleen and intestine no tubercle bacilli.

INTRAVENOUS INOCULATIONS OF FOWLS WITH CULTURES OF MAMMALIAN TUBERCLE BACILLI.

Virus.	Source of Culture.	Number of Fowl.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
B. IV.	Lung of Chimpanzee 24.	414	1,040	540	September 7, 1908.	6 days old, 8th generation.	549 days	10·0 mg.	Died 21 days.	The lungs were oedematous. Spleen normal. Necrotic foci in the liver. Kidneys normal. Moderately numerous T.B. in the lungs, spleen and liver.
B. IV.	Lung of Chimpanzee 24.	416	960	1,350	September 7, 1908.	6 days old, 8th generation.	549 days	10·0 mg.	Killed 81 days.	The liver was enlarged and had a yellowish red mottled appearance. Spleen enlarged. Lungs congested. Kidneys normal. A few tubercle bacilli in liver and lung, moderate number in the spleen.
B. IV.	Calf 118	418	1,110	800	September 8, 1908.	7 days old, 35th generation.	1,760 days	10·0 mg.	Died 10 days.	The liver was enlarged and pale. The lungs were very oedematous. Spleen and kidneys normal. Moderately numerous T.B. in the lungs, spleen and liver.
B. IV.	Calf 118	420	1,620	950	September 8, 1908.	7 days old, 35th generation.	1,760 days	10·0 mg.	Died 20 days.	Lungs were a little oedematous and contained numerous minute translucent tubercles, a few of which were slightly opaque in the centre: they were best seen from the pleural surface. Spleen and liver enlarged. Kidneys normal. There were moderately numerous T.B. in the four organs mentioned.
B. V.	Guinea-pig 711.	426	1,420	1,130	September 9, 1908.	8 days old, 36th generation.	1,724 days	10·0 mg.	Killed 84 days.	The organs appeared normal. Smears showed a few tubercle bacilli in the lung, liver and spleen.
B. V.	Guinea-pig 711.	428	1,150	720	September 9, 1908.	8 days old, 36th generation.	1,724 days	10·0 mg.	Died 28 days.	The lungs were congested and oedematous but showed no tubercles. Spleen, liver and kidneys normal. Fairly numerous T.B. in the lungs, spleen and liver.
B. VI.	Original material.	422	1,080	830	September 8, 1908.	7 days old, 33rd generation.	1,566 days	10·0 mg.	Killed 84 days.	Lungs a little oedematous. Liver enlarged and pale. Organs otherwise normal.
B. VI.	Original material.	424	1,120	620	September 8, 1908.	7 days old, 33rd generation.	1,566 days	10·0 mg.	Killed 62 days.	Liver enlarged and pale. Lung, spleen, kidneys, &c., normal. T.B. in spleen, liver, and lung.
B. VII.	Original material.	442	1,000	550	September 9, 1908.	9 days old, 31st generation.	1,566 days	10·0 mg.	Died 42 days.	Organs normal except for a few necrotic foci in the liver. Moderately numerous T.B. in spleen and lung; a few in kidney.
B. VII.	Original material.	444	1,120	1,000	September 9, 1908.	9 days old, 31st generation.	1,566 days	10·0 mg.	Died 60 days.	Lungs water-logged. Spleen pale. Liver large, pale, and soft: it had ruptured, filling the peritoneal cavity with blood. T.B. in liver and spleen.
B. IX.	Liver of Dog 130.	430	1,200	940	September 9, 1908.	8 days old, 3rd generation.	761 days	10·0 mg.	Died 36 days.	The lungs were oedematous and contained a moderate number of minute grey tubercles, a few caseous. Liver large, pale, and very soft. Spleen similar. Kidneys and intestines normal. Numerous T.B. in the liver, moderately numerous in the spleen and lung, none in the kidney.
B. IX.	Liver of Dog 130.	432	1,000	530	September 9, 1908.	8 days old, 3rd generation.	761 days	10·0 mg.	Died 51 days.	Animal emaciated. Spleen hardly larger than a pea. Other organs apparently normal. T.B. in lung, liver, spleen, and kidney.
B. IX.	Original material (Mediastinal gland of an ox).	354	1,100	1,050	March 3, 1908	11 days old, 45th generation.	1,352 days	1·0 mg.	Killed 59 days.	Organs normal in appearance. Smear preparations from liver and spleen showed no tubercle bacilli.

B. IX.	Original material (Mediastinal gland of an ox).	356	1,000	879	March 3, 1908	11 days old. 45th generation.	1,352 days	10·0 mg.	Killed 59 days.	Organs normal in appearance. Smears from liver and spleen showed a moderate number of tubercle bacilli.
B. XI.	Original material (Mediastinal gland of an ox).	374	1,950	2,050	March 20, 1908	20 days old, 36th generation.	1,348 days	1·0 mg.	Killed 42 days.	In the lungs there were three minute opaque tubercles. Smears from lung tubercle showed moderately numerous tubercle bacilli; from spleen and liver substance a few.
B. XII.	Original material (Mediastinal gland of an ox).	278	1,820	1,700	June 22. 1907	21 days old, 33rd generation.	1,060 days	1·0 mg.	Killed 157 days.	All organs appeared normal.
B. XII.	Original material (Mediastinal gland of an ox).	280	1.570	1,900	June 22, 1907	21 days old, 33rd generation.	1.060 days	10·0 mg.	Killed 157 days.	All organs appeared normal. Smear preparations from liver, spleen, and lung showed no tubercle bacilli. No growth obtained from liver and spleen.
B. XII.	Original material (Mediastinal gland of an ox).	296	2.750	1,350	September 6, 1907.	20 days old, 38th generation.	1,136 days	10·0 mg.	Died 44 days.	Lungs a little oedematous. A few yellowish grey foci in the liver and a grey focus beneath the capsule of spleen. Smear preparations showed a few tubercle bacilli in liver, moderately numerous in spleen, and a few in lung.
B. XXVI.	Original material (Bronchial gland of an ox).	80	—	—	July 26, 1906	14 days old. 17th generation.	359 days	1·0 mg.	Killed 102 days.	Lungs beset with numerous discrete tubercles up to a rape seed; the majority were opaque and yellowish with grey capsules. A few whitish foci in the liver. Smear preparations showed a few tubercle bacilli in liver, moderately numerous in lungs, none in the spleen or kidney. Culture from lung resembled that inoculated.
B. XXVI.	Original material (Bronchial gland of an ox).	82	—	—	July 26, 1906	14 days old. 17th generation.	359 days	10·0 mg	Died 53 days.	Lungs beset with tubercles similar to the above. Other organs normal. Smear preparations from lung showed numerous tubercle bacilli, a few in liver and marrow, none in spleen, kidney, or blood. Numerous mammalian tubercle colonies in cultures from the lungs.
B. XXVI.	Original material (Bronchial gland of an ox).	84	—	—	July 26, 1906	14 days old, 17th generation.	359 days	50·0 mg.	Killed 102 days.	Post-mortem appearance similar to the above. Smear preparations showed numerous tubercle bacilli in lungs and a few in liver. Culture from lung resembled that inoculated.
B. XXVI.	Lung of Fowl 84.	300	1,350	1,240	September 13, 1907.	21 days old. 6th generation.	312 days	10·0 mg.	Died 13 days.	Spleen large. measuring 4·4 by 3·0 by 2·5 cm.; the pulp just beneath the capsule had a greyish mottled appearance. Liver enlarged. Lungs oedematous. Smear preparations showed moderately numerous tubercle bacilli in lung, a few in liver, spleen, and bone marrow; none in kidney.
B. XXVI.	Lung of Fowl 84.	302	1,400	960	September 13, 1907.	21 days old, 6th generation.	312 days	10·0 mg.	Died 24 days.	Organs appeared normal. Smear preparations showed a moderate number of tubercle bacilli in lung and liver; none in spleen or kidney.
B. XXVI.	Original material (Bronchial gland of an ox).	304	1,200	3,370	September 19, 1907.	21 days old, 29th generation.	789 days	1·0 mg.	Killed 244 days.	No tuberculosis. Smear preparations from liver, spleen, lung, and kidney showed no tubercle bacilli.

INTRAVENOUS INOCULATIONS OF FOWLS WITH CULTURES OF MAMMALIAN TUBERCLE BACILLI—*continued.*

Virus.	Source of Culture.	Number of Fowl.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
B. XXVI.	Original material (Bronchial gland of an ox).	306	1,550	950	September 19, 1907.	21 days old, 29th generation.	789 days	10·0 mg.	Died 15 days.	Lungs a little oedematous, a few yellowish foci in the liver. Spleen and kidneys normal. Smear preparations showed moderately numerous tubercle bacilli in lung, spleen, and liver; none in the kidneys.
B. XXVI.	Liver of Fowl 300.	338	1,370	1,130	January 28. 1908.	9 days old, 2nd generation.	124 days	6·0 mg.	Died 19 days.	Lungs were oedematous and showed numerous translucent tubercles, a few caseous in the centre, just beneath the pleura. Spleen and liver enlarged and soft; there was a rupture of the liver and the peritoneal cavity was filled with blood stained fluid and clots. Kidneys normal. Numerous tubercle bacilli in lung, liver, and spleen; a few in the kidneys.
B. XXVI.	Liver of Fowl 300.	358	1,150	1,370	March 3, 1908	13 days old, 3rd generation	159 days	1·0 mg.	Killed 59 days.	Organs appeared healthy. A few tubercle bacilli in spleen and liver.
B. XXVI.	Liver of Fowl 300.	360	1,250	1,050	March 3, 1908	13 days old, 3rd generation.	159 days	10·0 mg.	Killed 59 days.	Lungs oedematous. Spleen enlarged. Liver pale. Smears showed a moderate number of tubercle bacilli in lung; a few in liver and spleen.
B. XXVI.	Spleen of Fowl 338.	410	1,050	770	September 7, 1908.	6 days old, 4th generation.	204 days	10·0 mg.	Killed 84 days.	The organs were apparently normal. A moderate number of tubercle bacilli in the spleen; a few in the liver.
B. XXVI.	Spleen of Fowl 338.	412	1,040	550	September 7, 1908.	6 days old, 4th generation.	204 days	10·0 mg.	Died 27 days.	The lungs were oedematous and sank entirely in water. Spleen small and pale. Liver and kidneys normal. A moderate number of T.B. in spleen, a few in lung and liver, none in the kidney.
B. XXVI.	Lung of Fowl 82.	446	920	800	September 9, 1908.	5 days old, 3rd generation.	723 days	10·0 mg.	Killed 84 days.	The organs appeared normal. A few tubercle bacilli were seen in the lung and spleen.
B. XXVI.	Lung of Fowl 82.	448	1,400	860	September 9, 1908.	5 days old, 3rd generation.	723 days	10·0 mg.	Died 21 days.	The lungs were oedematous but showed no tubercles. Liver and spleen were pale and a little enlarged. Kidneys normal. Fairly numerous T.B. in the lung, spleen, and liver, none in the kidney.
B. XXVI.	Local lesion of Fowl 202.	450	930	770	September 23, 1908.	13 days old, 4th generation	461 days	10·0 mg.	Killed 47 days.	Lungs oedematous, showed an occasional minute tubercle beneath the pleura. Liver a little enlarged. Spleen pale. Moderately numerous T.B. in spleen, none in lung and liver.
B. XXVI.	Local lesion of Fowl 202.	452	980	820	September 23. 1908.	13 days old, 4th generation.	461 days	10·0 mg.	Killed 78 days.	Liver enlarged. Spleen pale. Other organs normal. A few tubercle bacilli in lung and liver.
B. XXVI.	Liver of Fowl 360.	454	1,190	770	September 23, 1908.	13 and 19 days old. 2nd and 3rd generations.	204 days	10·0 mg.	Died 31 days.	Lungs were oedematous, no tubercles. Spleen and liver enlarged. Numerous T.B. in lung, spleen, and liver.
B. XXVI.	Liver of Fowl 360.	456	1,220	1,370	September 23, 1908.	13 and 19 days old, 2nd and 3rd generations.	204 days	5·0 mg.	Killed 78 days.	Liver was a little enlarged. Otherwise the organs were normal. A few tubercle bacilli in smears from the lung.
B. XXVI.	Local lesion of Fowl 344.	458	1,100	790	September 23, 1908.	4 days old, 4th generation.	239 days	10·0 mg.	Died 11 days.	The lungs were heavy, congested, and water-logged and sank wholly in water. No tubercles were visible. Spleen was enlarged and showed a few foci; a few also in the liver. Moderately numerous T.B. in the liver and spleen. A few in the lungs.
B. XXVI.	Local lesion of Fowl 344.	460	1,450	770	September 23, 1908.	4 days old, 4th generation.	239 days	5·0 mg.	Died 16 days.	The lungs were congested and oedematous in parts; they were reddish grey and closely beset with translucent tubercles, a few with opaque centres; in other parts there were discrete tubercles in crepitant lung tissue. Spleen and liver enlarged. Kidneys normal. Moderately numerous T.B. in the lung, liver, and spleen.

P XL.	Liver of Fowl 230.	472	1,250	1,450	September 24, 1908.	5 days old, 4th generation.	435 days	5·0 mg.	Killed 77 days.	In the lungs there were sparsely scattered grey tubercles with caseous centres, the size of rape seed. A few grey points in the liver. No disease elsewhere.
P. XL.	Original material (Submaxillary gland of a pig).	230	1,400	1,420	April 8, 1907	20 days old, 10th generation.	328 days	1·0 mg.	Killed 100 days.	Animal appeared healthy. Smears showed no tubercle bacilli in liver and spleen, a few in lungs.
P. XL.	Liver of Fowl 230.	364	1,220	930	March 3, 1907	13 days old, 3rd and 4th generations.	230 days	10·0 mg.	Killed 57 days.	Lungs oedematous; one minute tubercle beneath the pleura. A few necrotic foci in the liver. Spleen and kidneys normal. Smears from spleen and liver showed a few tubercle bacilli.
P. XLI.	Original material (Submaxillary gland of a pig).	128	750	1,180	November 15, 1906.	21 days old, 8th generation.	175 days	15·0 mg.	Killed 103 days.	All organs appeared normal except for the liver which showed moderately numerous discrete grey foci. Smear preparation from liver showed a few tubercle bacilli. No growth obtained from liver.
P. LIII.	Original material (Submaxillary gland of a pig).	286	930	780	July 15, 1907	21 days old, 8th generation.	185 days	10·0 mg.	Died 14 days.	The lungs were dark in colour, oedematous and did not collapse. Spleen was enlarged and beset with grey points. Liver and kidneys normal. Smear preparations showed numerous tubercle bacilli in lung, spleen and liver and a few in the kidney.
P. LIV.	Original material (Submaxillary gland of a pig).	288	900	680	July 15, 1907	21 days old, 7th generation.	185 days	30·0 mg.	Died 11 days.	Lungs very oedematous. Other organs appeared normal. Spleen, liver and lung showed numerous tubercle bacilli. A few in the kidney.
E. I.	Original material (Lesions of a horse through a guinea-pig).	234	1,490	—	April 17, 1907	21 days old, 18th generation.	482 days	20·0 mg.	Died 37 days.	Lungs congested; spleen slightly enlarged: no tubercles visible. Tubercle bacilli numerous in spleen, scanty in lungs and liver, absent in a smear from kidney.
E. II.	Prescapular gland of Calf 404.	350	1,150	770	February 11, 1908.	21 days old, 10th generation.	563 days	10·0 mg.	Killed 21 days.	Lungs oedematous: liver a little pale. Spleen and kidneys normal. Smear preparations showed numerous tubercle bacilli in lungs and spleen, a few in liver and none in kidney.
E. II.	Original material.	140	1,420	2,100	November 20, 1906.	21 days old, 16th generation.	334 days	10·0 mg.	Killed 98 days.	Lungs congested. Liver showed three collections of yellowish foci (no T.B.). The spleen measured 3·3 by 2·3 by 1·3 cm., but showed no tubercles. Kidneys normal.
E. II.	Original material.	138	1,250	2,280	November 20, 1906.	21 days old, 16th generation.	334 days	1·0 mg.	Killed 98 days.	The fowl was fat and quite healthy.
E. II.	Original material.	402	1,050	1,050	September 7, 1908.	7 days old, 19th generation.	992 days	10·0 mg.	Killed 63 days.	Liver enlarged, pale and soft. Other organs normal. Moderately numerous T.B. in lung, liver, and spleen.
E. II.	Original material.	404	1,070	1,200	September 7, 1908.	7 days old, 19th generation.	992 days	10·0 mg.	Killed 84 days.	The liver was enlarged and pale. Otherwise the organs were normal. Smears showed a few tubercle bacilli in the lung, liver, and spleen.
E. II.	Mediastinal Gland of Calf 406.	434	1,070	1,000	September 9, 1908.	8 days old, 12th generation.	742 days	10·0 mg.	Killed 61 days.	Liver enlarged, pale and soft. Other organs normal in appearance, showed T.B. in smear preparations.
E. II.	Mediastinal Gland of Calf 406.	436	1,190	1,200	September 9, 1908.	8 days old, 12th generation.	742 days	10·0 mg.	Killed 84 days.	The organs were apparently normal. Tubercle bacilli in smears from liver, lung, and spleen.
E. II.	Capsule from Fowl 368.	466	1,150	—	September 23, 1908.	19 days old, 3rd generation.	79 days	5·0 mg.	Killed 78 days.	All organs appeared normal. Smears showed a few T.B. in lung, none in the liver.

INTRAVENOUS INOCULATIONS OF FOWLS WITH CULTURES OF MAMMALIAN TUBERCLE BACILLI—*continued.*

Virus.	Source of Culture.	Number of Fowl.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
E. II.	Capsule from Fowl 268.	468	1,970	1,320	September 23, 1908.	19 days old, 3rd generation.	79 days	10·0 mg.	Killed 47 days.	Animal emaciated. Liver enlarged pale and soft. Other organs normal. T.B. in smear preparations.
E. III.	Original material.	156	1,300	2,150	November 24, 1906.	22 days old, 14th generation.	338 days	10·0 mg.	Killed 115 days.	Animal healthy.
E. III.	Original material.	154	1,260	1,600	November 24, 1906.	22 days old, 14th generation.	338 days	1·0 mg.	Killed 115 days.	In the lungs there were a few scattered deeply congested tubercles the size of rape seed. No disease elsewhere.
E. IV.	Original material.	136	1,050	650	November 20, 1906.	21 days old, 15th generation.	319 days	20·0 mg.	Died 59 days.	Body emaciated. Spleen slightly enlarged. Lungs congested and oedematous showed no tubercles. Numerous T.B. in spleen and liver, a few in lung and kidney.
E. IV.	Original material.	134	1,020	1,800	November 20, 1906.	21 days old, 15th generation.	319 days	1·0 mg.	Killed 98 days.	Lungs congested and oedematous. Spleen enlarged. A few grey tubercles in the liver. Kidneys normal. Smears showed numerous T.B. in spleen, a few in lungs and liver.
E. IV.	Original material	406	1.020	760	September 7, 1908.	7 days old, 20th generation.	1,005 days	10·0 mg.	Killed 63 days.	Organs normal in appearance. T.B. in lung and spleen.
E. IV.	Calf 408	438	950	670	September 9, 1908.	8 days old, 16th generation.	760 days	10·0 mg.	Died 21 days.	Animal emaciated. Lungs beset with minute yellowish caseous tubercles. Liver enlarged. Spleen and kidneys normal. Numerous tubercle bacilli in organs.
E. IV.	Calf 408	440	1,270	1,100	September 9, 1908.	8 days old, 16th generation.	760 days	10·0 mg.	Died 39 days.	Lungs oedematous. No tubercles in any of the organs. Infarct in the liver. Tubercle bacilli fairly numerous in lung and spleen.
Z. III.	Original material (Lung of an antelope).	474	1,150	900	September 24, 1908.	5 days old, 4th generation.	721 days	10·0 mg.	Killed 77 days.	The organs were normal. Smear preparations from the liver and spleen showed no tubercle bacilli.
Z. V.	Original material. (Mesenteric gland of a chimpanzee).	480	970	900	September 24, 1908.	14 days old, 4th generation.	850 days	10·0 mg.	Killed 77 days.	In the lungs was seen an occasional minute caseating tubercle. Other organs normal. A few tubercle bacilli in the lungs.
Z. V.	Original material.	482	1,120	1,400	September 25, 1908.	14 days old, 4th generation.	850 days	10·0 mg.	Killed 46 days.	In the lungs there were a few minute tubercles. Liver enlarged and pale. Two T.B. seen in the liver, none in the spleen and lung.

INTRAPERITONEAL INOCULATIONS OF FOWLS WITH CULTURES OF MAMMALIAN TUBERCLE BACILLI.

B. XII.	Original material (Mediastinal gland of an ox).	282[†]	2,100	2,800	June 22, 1907	21 days old, 33rd generation.	1,060 days	10·0 mg.	Killed 157 days	On the visceral peritoneum and on the mesentery there were scattered flattened grey nodules up to 2·0 mm. in diameter with opaque yellow centres. The spleen contained an irregular nodule the size of a wheat grain (avian culture obtained). Smear preparations from liver, lung, and spleen substance showed no tubercle bacilli.
B. XXVI.	Original material (Bronchial gland of an ox).	308	3,100	3,910	September 19, 1907.	21 days old, 29th generation.	789 days	50·0 mg.	Killed 131 days.	Inoculation partly into subcutaneous tissue where there was a tumour composed of yellow necrotic layers enclosed in a fibrous capsule. There were a few tubercles on the peritoneum. Animal otherwise healthy. No growth obtained from liver and spleen.
P. XII.	Original material (Submaxillary gland of a pig through Guinea-pig 1636).	66	—	—	June 29, 1906	21 days old, 9th generation.	298 days	50·0 mg.	Died 29 days.	On the peritoneum there were a few grey nodules with caseous centres up to 2·5 mm. The left lung was adherent to parietal wall and the posterior part was firm and fibrous. Smear showed numerous tubercle bacilli in the lung and pleura.
P. XIV.	Original material (Submaxillary gland of a pig).	68	—	—	June 29, 1906	21 days old 12th generation.	290 days	25·0 mg.	Killed 102 days.	On the parietal peritoneum on the left side there were numerous yellowish nodules up to a wheat grain and a layer of nodules under the peritoneum over the gizzard. Smear from the spleen showed a moderate number of tubercle bacilli, numerous in the liver and peritoneal nodules.
P. XLI.	Original material (Submaxillary gland of a pig).	186	1,070	1,120	January 24, 1907.	21 days old, 10th generation.	245 days	100·0 mg.	Killed 68 days.	Animal in good condition. The mesentery was thickened and contracted by nodules and bands consisting of yellow necrotic substance within fibrous capsules; numerous similar nodules on the peritoneal ligaments and on the visceral peritoneum. Organs normal. Numerous tubercle bacilli in the nodules. No growth was obtained in cultures made from three nodules.
E. I.	Original material (Lesions of a horse through a guinea-pig).	232	1,270	1,850	April 17, 1907	21 days old, 18th generation.	482 days	10·0 mg.	Killed 91 days.	On the peritoneum there were small scattered nodules consisting of translucent capsules with yellow necrotic centres; on the mesentery and meso-colon there were in addition moderately numerous minute glassy tubercles. No tuberculosis elsewhere. No tubercle bacilli were seen in smears from the liver and spleen.
E. II.	Original material (Mesenteric gland of a horse through a guinea-pig).	50	—	—	April 30, 1906	21 days old, 6th generation.	131 days	5·0 mg.	Killed 112 days.	In the muscle at the seat of inoculation there was a yellowish nodule the size of a hemp seed, and on the gizzard a deposit of yellowish friable substance containing numerous tubercle bacilli. No tuberculosis elsewhere. A few tubercle bacilli were seen in a smear from the liver, none in smears from the spleen and lung.
E. II.	Original material.	188	1,200	1,500	January 29, 1907.	21 days old, 19th generation.	404 days	10·0 mg.	Killed 133 days.	No peritoneal tuberculosis. A few foci in the liver (no T.B.). Other organs normal.
E. III.	Original material.	198	1,650	1,450	February 4, 1907.	21 days old, 18th generation.	410 days	10·0 mg.	Killed 127 days.	Animal appeared healthy.
E. IV.	Original material.	194	1,970	3,370	January 29, 1907.	21 days old. 18th generation.	389 days	10·0 mg.	Killed 133 days.	No peritoneal tuberculosis. Organs healthy.

[†] An avian culture was obtained from the spleen—natural infection.

INTRAMUSCULAR INOCULATIONS OF FOWLS WITH CULTURES OF MAMMALIAN TUBERCLE BACILLI.

Virus.	Source of Culture.	Number of Fowl.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
B. V.	Capsule from Pigeon 68.	**400**	1,490	2,000	June 26, 1908.	10 days old, 4th generation.	202 days	Growth from 2 serum tubes.	Killed 94 days.	Local lesion similar to Fowl 396. Two small yellow patches in liver.
B. XII.	Original material (Mediastinal gland of an ox).	**284**	1,910	2,050	June 22, 1907.	21 days old, 33rd generation.	1,060 days	10·0 mg.	Killed 157 days.	Animal in good condition. In the breast muscle there were thin sheets of yellow necrotic substance and the muscle around was stained an orange yellow tint. No disease elsewhere.
B. XII.	Original material (Mediastinal gland of an ox).	**294**	750	1,600	September 6, 1907.	20 days old, 38th generation.	1,136 days	164·0 mg.	Killed 143 days.	In the muscle there was a layer of fibrous tissue containing a few pieces of yellow necrotic substance. No tuberculosis elsewhere. Smear preparation from local lesion showed very numerous tubercle bacilli. No growth obtained from local lesion and liver.
B. XXVI.	Original material (Bronchial gland of an ox).	**4**	—	—	November 20, 1905.	20 days old, 6th generation.	111 days	10·0 mg.	Killed 85 days.	In the muscle there was a patch of fibrous tissue containing a layer of bright yellow necrotic substance. A single minute whitish tubercle beneath the capsule of the liver. No disease elsewhere. Smear preparation from local lesion showed very numerous tubercle bacilli.
B. XXVI.	Local lesion of Fowl 344.	**462**	1,350	1,820	September 23, 1908.	4 days old, 4th generation.	239 days	37·0 mg.	Killed 85 days.	Caseo-necrotic substance at the seat of inoculation in the breast muscle. No disease elsewhere. Smear from local lesion showed numerous T.B.
B. XXVI.	Local lesion of Fowl 4.	**38**	—	—	March 30, 1906.	16 days old, 2nd generation.	45 days	Growth from a serum tube.	Killed 118 days.	In the muscle there was an area composed of soft grey granulation tissue infiltrated with yellow necrotic substance. No tuberculosis elsewhere.
B. XXVI.	Lung of Fowl 82.	**126**	880	1,550	November 9, 1906.	10 days old, 3rd generation.	53 days	Not estimated.	Killed 94 days.	Animal in good condition; local lesion only, resembling that in Fowl 294. Culture obtained from local lesion.
B. XXVI.	Local lesion of Fowl 202.	**344**	1,020	1,450	January 28, 1908.	9 days old, 5th generation.	222 days	50·0 mg.	Killed 118 days.	In the muscle at the seat of inoculation there were layers of lemon yellow necrotic substance and the surrounding muscle was stained an orange yellow colour. No disease elsewhere.
E. I.	Original material (Lesions of a horse through a guinea-pig).	**236**	1,540	1,670	April 17, 1907.	21 days old, 18th generation.	482 days	10·0 mg.	Killed 91 days.	In the muscle at the seat of inoculation there was a thin layer of yellow necrotic substance and the surrounding muscle was stained yellow. The lungs were oedematous. The abdominal organs appeared normal. A few tubercle bacilli were seen in a smear from the liver.
E. II.	Original material (Mesenteric gland of a horse through a guinea-pig).	**48**	—	—	April 30, 1906.	21 days old, 6th generation.	131 days	5·0 mg.	Killed 112 days.	There was a flat fibrous-walled cavity in the subcutaneous tissues at the seat of inoculation containing a scaly yellow substance around the walls. In the intestinal wall there was a yellow focus (smear, a few tubercle bacilli). There was no tuberculosis elsewhere; a smear from the liver showed small clumps of tubercle bacilli.

E. II.	Capsule from Fowl 368.	**464**	1,080	—	September 23, 1908.	19 days old. 3rd generation.	74 days	92·0 mg.	Killed 85 days.	In the left breast muscle there were layers of bright yellow necrotic substance and some serous fluid; the muscle around was stained. No disease elsewhere. Smear from local lesion showed numerous T.B.
E. II.	Capsule from Pigeon 60.	**396**	1,100	1,830	June 26, 1908.	10 days old, 4th generation.	203 days	Growth from 2 serum tubes.	Killed 95 days.	In the muscle there were layers of yellow necrotic substance. No tuberculosis elsewhere.
E. II.	Capsule from Pigeon 62.	**398**	1,350	2,000	June 26, 1908.	10 days old, 5th generation.	203 days	Growth from 2 serum tubes.	Killed 94 days.	Local lesion similar to above. A few foci in the liver.
E. II.	Original material.	**190**	1,300	2,140	January 29, 1907.	21 days old, 19th generation.	404 days	10·0 mg.	Killed 133 days.	Caseo-necrotic substance between the layers of the muscle which showed orange yellow staining around. Organs healthy.
E. III.	Original material.	**196**	1,280	1,480	February 4, 1907.	21 days old, 18th generation.	410 days	10·0 mg.	Killed 127 days.	In the breast muscle there was an area of orange yellow fibrous tissue with patches of caseo-necrotic substance. Organs healthy.
E. IV.	Original material.	**192**	1,600	1,970	January 29, 1907.	21 days old. 18th generation.	389 days	10·0 mg.	Killed 133 days.	At the seat of inoculation part of the breast muscle was opaque, yellowish, and fibrous. Organs healthy.
E. IV.	Original material.	**408**	920	—	September 7, 1908.	7 days old. 20th generation.	1,005 days	10·0 mg.	Killed 101 days.	Caseo-necrotic substance in the breast muscle at the seat of inoculation. No disease elsewhere. Local lesion showed numerous T.B.
P. IV.	Capsule from Pigeon 64.	**394**	1,320	2,380	June 26, 1908	10 days old. 5th generation.	202 days	Growth from 2 serum tubes.	Killed 94 days.	Post-mortem appearances similar to Fowl 396.
P. XL.	Liver of Fowl 230.	**470**	850	790	September 24, 1908.	5 days old, 4th generation.	435 days	82·0 mg.	Killed 16 days.	The organs appeared normal. No tubercle bacilli were seen in smears from the lung, liver, or spleen.
Z. III.	Original material (Lung of an antelope).	**476**	1,150	1,020	September 24, 1908.	5 days old, 4th generation.	721 days	47·0 mg.	Died 14 days	Death premature. A few necrotic flakes in the left breast muscle. Smear from the spleen showed three tubercle bacilli. None in the lung.
Z. V.	Original material (Mesenteric gland of a chimpanzee).	**478**	1,150	1,120	September 24, 1908.	14 days old, 4th generation.	850 days	100·0 mg.	Killed 75 days	The left breast muscle was swollen, and on section it contained in the intermuscular planes fluid together with yellow necrotic substance. The liver was large and soft, and on section a single tubercle was seen. Other organs normal. Smear from local lesion showed numerous T.B.

INTRAPERITONEAL AND INTRAMUSCULAR INOCULATIONS OF FOWLS WITH EMULSIONS CONTAINING MAMMALIAN TUBERCLE BACILLI.

Virus.	Material.	Number of Fowl.	Weight in Grammes.		Date of Inoculation.	Duration of Life.	Result.
			Initial.	Final.			
B. IV.	Lung of Fowl 420	**488**	1,250	1,790	September 28, 1908	Killed 80 days	On the peritoneal ligaments there were about six caseous tubercles. The spleen showed three tubercles (no T.B.) the size of rape seed, and there were a few similar tubercles (no. T.B.) in the liver. No disease elsewhere.
B. XXVI.	Lung of Fowl 460	**514**	1,600	1,950	October 9, 1908	Killed 69 days	At the seat of inoculation in the left breast muscle there were sheets of yellow stained fibrous tissue in the inter-muscular planes. Two tubercles in the liver. No disease elsewhere. Smear from local lesion showed numerous T.B.

FEEDING EXPERIMENTS ON FOWLS WITH CULTURES OF MAMMALIAN TUBERCLE BACILLI.

Virus.	Source of Culture.	Number of Fowl.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture used.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
B. IV.	Guinea-pig 1407.	18	—	—	February 12, 1906.	21 days old, 6th generation.	337 days	1·0 mg.	Killed 87 days.	Animal healthy.
B. IV.	Guinea-pig 1407.	20	—	—	February 12, 1906.	21 days old, 6th generation.	337 days	1·0 mg.	Killed 45 days.	No tuberculosis.
B. IX.	Lemur 2	8	—	—	November 24, 1905.	23 days old, 6th generation.	129 days	47·0 mg.	Killed 82 days.	Animal healthy.
P. IV.	Lung of Calf 312.	12	—	—	December 4, 1905.	20 days old, 4th generation.	48 days	32·0 mg.	Killed 78 days.	Animal healthy.
E. II.	Original material (Mesenteric gland of a horse through a guinea-pig).	46	—	—	April 30, 1906	21 days old, 6th generation.	131 days	5·0 mg.	Killed 112 days.	Animal healthy.

INOCULATION EXPERIMENTS ON FOWLS WITH DEAD TUBERCLE BACILLI.

Virus.	No. of Fowl.	Weight in Grammes.		Date of Inoculation.	Dose.	Method of Inoculation.	Duration of Life.	Result.
		Initial.	Final.					
Bovine	492	850	940	October 1, 1908	10·0 mg.	Intravenous	Killed 35 days	The lungs were oedematous and contained numerous caseating tubercles up to a millet seed. Spleen swollen and red. Liver enlarged and closely filled with irregular necrotic foci. Kidneys and intestines normal. T.B. in lung and liver. Two G.P.s inoculated with lung were healthy when killed after 42 days.
Bovine	502	1,270	1,270	October 2, 1908	10·0 mg.	Intravenous	Killed 38 days	The lungs were a little congested and oedematous; they were fairly closely filled with minute translucent tubercles, many opaque in the centre. Other organs normal, except for a few foci in the liver. Smear from liver showed no T.B. No growth from liver.
Bovine	510	1,020	1,250	October 8, 1908	Not estimated.	Intravenous	Killed 41 days	The organs appeared normal.
Bovine	500	1,270	1,440	October 2, 1908	250·0 mg.	Intraperitoneal	Killed 75 days	On the peritoneal ligaments there were scattered grey nodules with bright yellow material in the centre varying up to a hemp seed; near the gizzard were two larger nodules. In the lungs there were two minute caseous tubercles. Other organs normal,

Avian	392	1,450	720	May 21, 1908	Not estimated.	Intravenous	Died 46 days	Animal emaciated. Spleen not enlarged. Other organs normal. A few tubercle bacilli in the lung: a moderate number in the liver and none in the spleen or kidney.
Avian	506	920	1,100	October 7, 1908	100·0 mg.	Intravenous	Killed 57 days	The organs appeared normal.
Avian	508	850	1,140	October 7, 1908	200·0 mg.	Intravenous	Killed 42 days	The lungs were a little congested and showed moderately numerous minute translucent tubercles varying up to a rape seed in size, of which many contained definite opaque centres. Other organs normal.
Equine	490	870	1,300	October 1, 1908	10·0 mg.	Intravenous	Killed 35 days	Lungs showed a moderate number of minute translucent tubercles, a few caseating. No disease of the other organs. Animal in good condition.
Human (Group II.).	526	1,220	1,150	October 27, 1908	200·0 mg.	Intravenous	Killed 44 days	The lungs were oedematous. The liver and spleen were enlarged. No tubercles could be seen.
Human (Group II.).	528	1,420	1,270	October 27, 1908	200·0 mg.	Intravenous	Killed 44 days	The liver and spleen were enlarged, otherwise the organs were normal.
Human (Group II.).	530	1,520	1,150	October 27, 1908	50·0 mg. + glass powder.	Intravenous	Killed 44 days	The lungs were congested and adherent to the chest wall. On section through the lungs it was found that the greater part of the lung tissue was beset with minute confluent caseous tubercles which, outlining the air spaces, formed a caseous network. A fowl inoculated with powdered glass intravenously showed no disease when killed after 43 days.

INTRAMUSCULAR INOCULATIONS OF PIGEONS WITH CULTURES OF AVIAN TUBERCLE BACILLI.

Virus.	Source of Culture.	Number of Pigeon.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
A. X.	Original material (Lung of a fowl).	116	390	350	December 1, 1908.	28 days old, 14th generation.	672 days	10·0 mg.	Killed 91 days.	Bright yellow necrotic local lesion. A few minute grey tubercles in the liver. No tuberculosis elsewhere.
A. X.	Original material (Lung of a fowl).	118	370	350	December 1, 1908.	28 days old, 14th generation.	672 days	10·0 mg.	Killed 91 days.	Yellow necrotic local lesion. Liver filled with minute irregular grey foci. No lesions elsewhere.
A. X.	Original material (Lung of a fowl).	120	420	490	December 1, 1908.	28 days old, 14th generation.	672 days	1·0 mg.	Killed 91 days.	Caseo-necrotic local lesion. Numerous grey submiliary tubercles in the spleen. A few foci in the liver. No other disease.
A. X.	Original material (Lung of a fowl)	122	120	120	December 1, 1908.	28 days old, 14th generation,	672 days	0·1 mg.	Killed 91 days.	Caseo-necrotic local lesion. Spleen showed a number of grey points (T.B.). Liver enlarged. No disease elsewhere.

INTRAMUSCULAR INOCULATIONS OF PIGEONS WITH CULTURES OF MAMMALIAN TUBERCLE BACILLI.

Virus.	Source of Culture.	Number of Pigeon.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
B. IV.	Calf 118	124	470	460	December 1, 1908.	33 days old, 37th generation.	1,850 days	37·0 mg.	Killed 79 days.	Yellow caseo-necrotic local lesion. No other disease. Smear from spleen, no T.B.
B. IV.	Calf 118	126	420	—	December 1, 1908.	33 days old, 37th generation.	1,850 days	37·0 mg.	Killed 81 days.	Caseo-necrotic local lesion. No other disease.
B. VI.	Original material.	128	350	340	December 1, 1908.	33 days old, 35th generation.	1,652 days	27·0 mg.	Killed 79 days.	Caseo-necrotic local lesion. No disease elsewhere. Smear from spleen, no T.B.
B. VI.	Original material.	130	770	610	December 1. 1908.	33 days old, 35th generation.	1,652 days	27·0 mg.	Killed 40 days.	Caseous local lesion. A few yellowish tubercles up to rape-seed in size in the liver and lungs. No other disease.

INTRAMUSCULAR INOCULATIONS OF PIGEONS WITH CULTURES OF MAMMALIAN TUBERCLE BACILLI AFTER PASSAGE THROUGH FOWLS.

B. IV.	Local lesion of Fowl 394.	84	290	340	November 17, 1908.	7 days old, 3rd generation.	49 days	36·0 mg.	Killed 91 days.	Caseo-necrotic local lesion only. Smear from liver, no T.B.
B. IV.	Local lesion of Fowl 394.	86	330	390	November 17, 1908.	7 days old, 3rd generation.	49 days	36·0 mg.	Killed 91 days.	Caseo-necrotic local lesion only.
B. VII.	Spleen of Fowl 442.	110	280	270	November 19, 1908.	9 days old, 2nd generation.	29 days	4·0 mg. (Intrap.).	Died 54 days.	No peritoneal tuberculosis. Left lung reddish grey, solid, and beset with yellow foci (T.B.). Solid patches in the right lung. Liver, spleen, and kidneys normal.
B. IX.	Lung of Fowl 430.	80	360	410	November 17, 1908.	7 days old, 3rd generation.	33 days	24·0 mg.	Killed 91 days.	Caseo-necrotic local lesion only. Smear from liver, no T.B.
B. IX.	Lung of Fowl 430.	82	290	370	November 17, 1908.	7 days old, 3rd generation	33 days	24·0 mg.	Killed 91 days.	Local lesion similar to above. A few T.B. in a smear from the spleen.

B. XXVI.	Liver and spleen of Fowl 454.	88	370	400	November 17, 1908.	7 days old, 3rd generation.	24 days	31·0 mg.	Killed 91 days.	Breast muscle partly caseo-necrotic. No disease elsewhere
B. XXVI.	Liver and spleen of Fowl 454.	90	370	430	November 17, 1908.	7 days old, 3rd generation.	24 days	31·0 mg.	Killed 91 days.	Local lesion only.
B. XXVI.	Liver and lung of Rabbit 1903.	104	320	320	November 19, 1908.	18 and 9 days old, 2nd and 3rd generations.	31 days	20·0 mg.	Killed 91 days.	Local lesion of caseous substance. Spleen was enlarged and contained a few T.B.
E. II.	Local lesion of Fowl 396.	100	340	360	November 17, 1908.	7 days old, 3rd generation.	49 days	37·0 mg.	Killed 91 days.	Local lesion only. Smear from liver showed no T.B.
E. II.	Local lesion of Fowl 396.	102	270	370	November 17, 1908.	7 days old, 3rd generation.	49 days	37·0 mg.	Killed 91 days.	Local lesion only.
E. II.	Local lesion of Fowl 398.	96	420	450	November 17, 1908.	7 days old, 3rd generation.	50 days	26·0 mg.	Killed 91 days.	Local lesion only. Smear from liver showed no T.B
E. II.	Local lesion of Fowl 398.	98	440	520	November 17, 1908.	7 days old, 3rd generation.	50 days	26·0 mg.	Killed 91 days.	Local lesion only.
E. IV.	Spleen of Fowl 438.	92	390	430	November 17, 1908.	7 days old, 3rd generation.	49 days	57·0 mg.	Killed 91 days.	Local lesion only.
E. IV.	Spleen of Fowl 438.	94	340	400	November 17, 1908.	7 days old, 3rd generation.	49 days	57·0 mg.	Killed 91 days.	Local lesion. A small yellow necrotic patch in the liver (T.B.). No other disease.
E. IV.	Liver and spleen of Fowl 440.	106	320	320	November 19, 1908.	9 days old, 2nd generation.	32 days	20·0 mg.	Killed 91 days.	Local lesion. Spleen a little enlarged (no T.B.).
E. IV.	Liver and spleen of Fowl 440.	108	350	370	November 19, 1908.	9 days old, 2nd generation.	32 days	20·0 mg.	Killed 91 days.	Local lesion. Smear from spleen showed a moderate number of T.B.

TABULAR SUMMARY OF INOCULATION AND FEEDING EXPERIMENTS ON PARROTS WITH AVIAN TUBERCLE BACILLI.

Virus.	Source of Culture.	Number of Parrot.	Date of Inoculation.	Method of Inoculation.	Dose.	Generation and Age of Subculture Inoculated.	Total Period under Cultivation.	Duration of Life.	Result.
A. VI.	Original material (Spleen of a pheasant).	2	September 21, 1907.	Intramuscular	10·0 mg.	6th generation, 21 days old.	529 days	Died 95 days	Body emaciated. Caseous tumour 5 by 3·5 by 2 cm. on breast bone which was ulcerated through and had a mass of caseous nodules on the under surface. Spleen, 5·0 mm. in diameter, filled with minute yellow foci. Liver very soft, contained numerous grey tubercles up to a rape seed, some opaque A single caseous tubercle in right kidney. Lungs oedematous, showed a few caseous miliary tubercles, and in the left a hard caseous mass. Numerous tubercle bacilli in lung, kidney and liver tubercles; a few in the spleen.
A. VI.	Original material (Spleen of a pheasant).	4	September 21, 1907.	Fed from a pipette.	1·0 mg.	6th generation, 21 days old.	529 days	Died 76 days	The animal had inhaled the culture emulsion as there was a caseous mass replacing a third of the right lung and extending down the right side into the pelvis. The intestines were matted together and covered with caseous nodules. Spleen showed sparsely scattered grey foci. The liver was beset with grey and yellowish tubercles up to a rape seed. Miliary tubercle in left kidney. Pharynx, intestinal mucous membrane, etc., normal. Numerous tubercle bacilli in the lung mass.
A. VIII.	Original material (Spleen of a fowl).	18	April 7, 1908	Fed in drinking water.	50·0 mg.	8th generation, 22 days old.	501 days	Died 113 days	Pharynx, larynx, and intestines normal. In the liver there were irregularly distributed bright yellow caseous foci and patches up to 2 and 3 mm. in greatest diameter. The spleen was small and showed two minute opaque foci. Kidneys normal. The lungs did not collapse; they were firm and almost replaced by irregular yellow caseo-necrotic masses, leaving only a few islands of lung tissue. Heart normal.
A. X.	Original material (Lung of a fowl).	20	May 21, 1908.	Intravenous	0·01 mg.	11th generation, 12 days old.	478 days	Died 113 days	At the caudal extremity of the right lung there was a cavity with a fibrous wall lined by an opaque yellowish-white adherent membrane. The whole of the rest of the lung was dark red and pneumonic, and the bronchi contained plugs of firm whitish substance; there was similar substance in the alveoli. The inferior half of the left lung resembled the right. In the liver there were a few grey foci. Spleen and kidneys normal. A few tubercles on the peritoneum. Smear preparations showed numerous T.B. in the lining of the cavity of the lung; scattered T.B. in the liver substance, and none in the spleen. The bronchial plugs contained no cells or bacilli.

TABULAR SUMMARY OF INOCULATION AND FEEDING EXPERIMENTS ON PARROTS WITH BOVINE TUBERCLE BACILLI.

Virus.	Source of Culture.	Number of Parrot.	Date of Inoculation.	Method of Inoculation.	Dose.	Generation and Age of Subculture Inoculated.	Total Period under Cultivation.	Duration of Life.	Result.
B. XI.	Original material	10	March 20, 1908	Intravenous	0·01 mg.	36th generation, 20 days old.	1,348 days.	Died 36 days	Lungs were oedematous and contained fairly numerous caseating tubercles up to a rape seed. Spleen was enlarged, measuring 1·5 cm., and was replaced by opaque yellow caseating tissue. The liver was large and was filled with greenish yellow caseous foci aggregated into small irregular patches. In the cortices of the kidneys there were scattered irregular grey foci. There were caseous tubercles in the muscles and subcutaneous tissue. Smears made from liver and kidney showed moderately numerous tubercle bacilli.

B. XI.	Original material	14	March 20, 1908	Intravenous	0·1 mg.	36th generation, 20 days old.	1,348 days.	Died 17 days	Lungs were dark, firm, and sank completely in water; the parenchyma on section was closely filled with minute caseating tubercles. Spleen, measuring 1·3 by 1·0 cm. was pale. Liver pale. Kidneys normal. Tubercle bacilli were numerous in the spleen, liver, and kidney, and very numerous in the lung.
B. XI.	Original material	12	March 20, 1908	Subcutaneous	10·0 mg.	36th generation, 20 days old.	1,348 days.	Died 40 days	Ulcer in skin covered with a dry scab. Thin layer of caseated tissue in the subcutaneous tissue. Spleen, 1·8 by 1·5 by 1 cm., was enlarged, firm, and almost entirely replaced by yellowish grey caseous tissue. Liver substance was greenish yellow and showed scattered yellowish necrotic foci. Lungs and kidneys showed no tubercles. Tubercle bacilli were very numerous in the spleen, numerous in the liver and kidney, and moderately numerous in the lung.
B XI.	Original material	16	March 20, 1908	Fed in drinking water.	50·0 mg.	36th generation, 20 days old.	1,348 days.	Died 83 days	Tongue, pharynx, larynx, and intestines normal. Lungs were reddish grey and closely filled with caseous tubercles and nodules up to a pea in size. Spleen, 1·1 by 9 cm., was speckled with yellowish grey foci. Liver substance closely beset with minute greyish white and yellowish caseous tubercles. Right kidney contained a caseous nodule the size of a wheat grain. Smear from scraping of small intestine showed no tubercle bacilli.
B. XXVI.	Original material	6	October 9, 1907	Intramuscular	10·0 mg.	30th generation, 20 days old.	799 days	Died 113 days	In the muscle there were sheets of greasy yellow necrotic substance. On the left side of the neck in subcutaneous tissue there were several yellow miliary nodules. The local lesion had ulcerated through the bone, and there was a sheet of necrotic substance on the inner surface. In the lungs there were scattered minute grey tubercles with yellowish centres. A few grey foci in the liver. A single yellow miliary tubercle in the spleen. Kidneys normal. No tubercle bacilli were seen in the intrathoracic mass or the liver; they were numerous in the local lesion. A culture grew from the liver substance.
B. XXVI.	Original material	8	October 9, 1907	Fed with pipette.	42·0 mg.	30th generation, 20 days old.	799 days	Died 57 days	Pharynx, larynx, and trachea normal. Two small ulcerated surfaces in the small intestine. Three caseous nodules on the peritoneal surface. At the caudal extremity of right lung there was a caseous mass 1·8 by 1·2 by 1·0 cm.; two smaller masses in the left lung and four pea-sized necrotic nodules. A few grey points in the spleen pulp. Liver enlarged and speckled with grey foci and small necrotic patches. Kidneys normal. In the pelvis adherent to the bone there were four nodules resembling those in the lungs. Numerous tubercle bacilli in lung nodule, a few in the intestine, pelvic nodule, liver and spleen.

INTRAVENOUS INOCULATIONS OF RABBITS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM BIRDS.

Virus.	Source of Culture.	Number of Rabbit.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
A. VIII.	Original material (Spleen of a fowl).	1352	1,000	860	May 28, 1907	21 days old, 4th generation.	186 days	10·0 mg.	Died 22 days.	The spleen was enlarged and in the substance were numerous irregular greyish-white foci. The liver and kidneys were pale but no foci could be seen. The lungs were very oedematous and irregularly congested ; a smear preparation from the parenchyma showed numerous tubercle bacilli.
A. I.	Original material (Intestine of a touracou).	834	1,490	1,100	April 26, 1906	21 days old, 4th generation.	70 days	1·0 mg.	Died 16 days.	Spleen small, no foci visible. Lungs pink and a little oedematous. Liver normal. Kidneys pale. The liver, spleen, and bone-marrow showed microscopically swarms of tubercle bacilli.
A. II.	Original material (Spleen of a pigeon).	886	1,520	1,180	May 22, 1906	21 days old, 4th generation.	69 days	1·0 mg.	Died 17 days.	Spleen swollen, no foci visible. Liver and kidneys appeared normal. The lungs were pink in colour except for one caudal lobe which was congested and showed numerous grey points. Lymphatic glands normal. Smear from liver showed very numerous tubercle bacilli.
A. II.	Original material (Spleen of a pigeon).	1258	1,500	1,100	March 1, 1907	20 days old, 9th generation.	352 days	1·0 mg.	Died 18 days.	Spleen enlarged, Malpighian bodies prominent. Kidneys pale. Liver normal in appearance. Lungs and bronchial glands oedematous, one lobe solid and beset with purulent foci. Very numerous tubercle bacilli in all the organs.
A. III.	Original material (Lung of a demoiselle crane).	1236	1,420	1,250	February 6 1907.	22 days old, 4th generation.	315 days	1·0 mg.	Died 19 days.	Spleen mottled on the surface with grey foci. A few grey points in the liver. Kidneys pale. Lungs pink in colour and a little oedematous. Lymphatic glands normal. Very numerous T.B. in the liver.
A. VI.	Original material (Spleen of a pheasant).	1484	1,670	1,540	September 21, 1907.	21 days old, 6th generation.	529 days	1·0 mg.	Died 12 days.	Post-mortem appearances resembled those of Rabbit 834.
A. VII.	Original material (Spleen of a fowl).	1603	2,670	1,620	January 24, 1908.	21 days old, 8th generation.	430 days	1·0 mg.	Died 47 days.	Spleen was enlarged and surrounded by a thin fibrinous capsule which stripped off readily ; the pulp was packed with confluent greyish-white tubercles. Irregular grey foci in the liver. Kidneys were pale and showed a few translucent foci. Lungs congested and oedematous showed a few transparent foci and one minute caseating tubercle. Caseous tubercles in the bronchial, mediastinal, and mesenteric glands. Inguinal and axillary glands normal. Moderately numerous tubercle bacilli in the liver and lung.
A. VIII.	Original material (Spleen of a fowl).	1353	1,100	940	May 28, 1907	21 days old, 4th generation.	186 days	1·0 mg.	Died 22 days.	Result similar to that in Rabbit 1236.
A. VIII.	Original material (Spleen of a fowl).	1354	1,380	900	May 28, 1907	21 days old, 4th generation.	186 days	1·0 mg.	Died 25 days.	Result similar to that in Rabbit 1236, except that the spleen was larger and there were more numerous greyish-white foci just beneath the surface.
A. X.	Original material (Lung of a fowl).	1791	1,290	1,150	June 4, 1908	14 days old, 12th generation.	492 days	1·0 mg.	Died 18 days.	The spleen was swollen and showed grey points beneath the capsule. Liver oedematous ; no points visible. Kidneys pale. Lungs oedematous

A. X.	Original material (Lung of a fowl).	1794	1,170	950	June 4, 1908	14 days old, 12th generation.	492 days	1·0 mg.	Died 18 days.	Post mortem appearances resembled the above.
A. II.	Original material (Spleen of a pigeon).	887	1,650	1,000	May 22, 1906	21 days old, 4th generation.	69 days	0·1 mg.	Died 20 days.	Spleen enlarged, 7·5 by 1·3 cm., and speckled with numerous grey points. Other organs and lymphatic glands normal in appearance. Smears from liver and bone marrow showed numerous tubercle bacilli.
A. III.	Original material (Lung of a demoiselle crane).	990	1,350	950	July 14, 1906	22 days old, 4th generation.	108 days	0·1 mg.	Died 33 days.	Result resembled that in Rabbit 887. The body was very pale, almost bloodless.
A. IV.	Original material (Liver of a pheasant).	963	1,620	1,500	July 4, 1906	22 days old, 4th generation.	89 days	0·1 mg.	Died 26 days.	Result resembled that in Rabbit 887 except that very numerous minute grey foci were visible in the liver substance and the lungs were oedematous.
A. VI.	Original material (Spleen of a pheasant).	1483	2,300	1,870	September 21, 1907.	21 days old, 6th generation.	529 days	0·1 mg.	Died 43 days.	Spleen greatly enlarged, substance packed with confluent greyish-white foci; the whole spleen was enclosed in a thin capsule formed from fibrin which stripped off easily. In the liver there were numerous irregular grey foci. Lungs were very oedematous, reddish-grey, and airless, but contained no tubercles. Bronchial glands oedematous. Minute grey tubercles in areolar tissues of inguinal and axillary regions.
A. VII.	Original material (Spleen of a fowl).	1278	2,150	1,250	March 12, 1907	21 days old, 4th generation.	112 days	0·1 mg.	Died 31 days.	Spleen enlarged. Lungs oedematous. Organs otherwise normal in appearance. Smear preparations showed numerous tubercle bacilli.
A. VII.	Original material (Spleen of a fowl).	1602	2,140	1,450	January 24, 1908.	21 days old, 8th generation.	430 days	0·1 mg.	Died 33 days.	Spleen swollen and packed with greyish-white foci, in parts confluent. Numerous irregular grey foci in the liver and a few in the kidneys. The lungs were pink and oedematous, and they showed minute translucent tubercles, some opaque in the centre, beneath the pleura. Lymphatic glands normal.
A. X.	Original material (Lung of a fowl).	1557	1 720	1,370	November 27, 1907.	21 days old, 7th generation.	302 days	0·1 mg.	Died 22 days.	Spleen swollen and peppered with grey points. Very minute foci visible in the liver forming a fine network. Lungs pink and crepitant showed scattered grey tubercles, some caseating. Kidneys and lymphatic glands normal. Lung tubercles contained very numerous tubercle bacilli.
A. X.	Original material (Lung of a fowl).	1387	2,260	1,950	July 9, 1907	21 days old, 5th generation.	161 days	0·1 mg	Died 26 days.	Result similar to that in Rabbit 887. On the liver there were several flat caseous nodules up to 2 mm. containing numerous tubercle bacilli.
A. V.	Original material (Spleen of a pheasant).	958	1,850	1,340	July 4, 1906	22 days old, 4th generation.	88 days	0·01 mg.	Died 145 days.	Spleen slightly enlarged. Liver normal. Kidneys showed in cortices dark depressed areas containing grey nodules up to a wheat grain beset with caseous foci; caseous streaks in the pyramids. Lungs slightly oedematous showed scattered grey tubercles with opaque centres and a few caseous nodules in the margins. Limb joints distended with caseopus. Opaque focus in a mesenteric gland; other lymphatic glands appeared normal. The kidney and lung nodules contained numerous tubercle bacilli.

INTRAVENOUS INOCULATIONS OF RABBITS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM BIRDS—*continued.*

Virus.	Source of Culture.	Number of Rabbit.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
A. VI.	Original material (Spleen of a pheasant).	1482	1,770	1,100	September 21, 1907.	21 days old, 6th generation.	529 days	0·01 mg.	Died 40 days.	Spleen greatly enlarged ; surface mottled with greyish white patches formed of confluent nodules, on section the enlarged Malpighian bodies formed a translucent network. Liver enlarged ; beneath the surface were haemorrhagic points but no grey foci visible. Kidneys similar. Lung parenchyma was congested and oedematous and showed a fine grey network throughout. Minute tubercles in axillary, inguinal and retro-peritoneal tissues. Lymphatic glands normal except for an opaque focus in one bronchial gland. A smear from liver showed swarms of tubercle bacilli.
A. VII.	Original material (Spleen of a fowl).	1279	1,620	1,100	March 12, 1907	21 days old, 4th generation.	112 days	0·01 mg.	Died 43 days.	Spleen very large, measuring 10 by 3·2 by 1·0 cm. and filled with irregular greyish white confluent nodules about the size of rape seed. Numerous grey foci in the liver. Lungs were very oedematous and had the margins caseated. An occasional tubercle in the kidneys. A few caseous foci in the ventral mediastinal glands. Discrete caseous tubercles in the areolar tissues, axillary, retro-peritoneal, &c. Other lymphatic glands normal. Suprarenal body apparently normal contained numerous tubercle bacilli. A tubercle from the inguinal region showed very numerous tubercle bacilli.
A. X.	Original material (Lung of a fowl).	1385	1,800	1,570	July 9, 1907	21 days old, 5th generation.	161 days	0·01 mg.	Killed 144 days.	Spleen and liver normal. In each kidney were two grey miliary tubercles with caseous centres extending as streaks through the pyramids. The lungs contained one caseo-calcareous nodule 2 mm. in diameter, a marginal caseous nodule, and occasional translucent foci. Lymphatic glands normal. Both wrist and elbow joints, both ankle joints and left knee joint were filled with soft caseous substance.
A. X.	Original material (Lung of a fowl).	1558	1,540	1,420	November 27, 1907.	21 days old, 7th generation.	302 days	0·01 mg.	Died 53 days.	Spleen greatly enlarged measured 11·5 by 3·5 by 1·5 cm., the capsule was thickened and greyish white, and on section the pulp was closely filled with grey and yellowish necrotic nodules. The kidneys contained a few translucent tubercles with opaque centres up to a rape seed. In the liver there were moderately numerous irregular grey foci. The lungs were pink and a little oedematous ; beneath the pleura were a few minute caseating tubercles and the anterior extremities were collapsed. Caseous foci in the mediastinal and portal glands. Tubercles in the axillary and inguinal regions and on the peritoneum.
A. X.	Original material (Lung of a fowl).	1384	1,960	1,240	July 9, 1907	21 days, 5th generation.	161 days	0·001 mg.	Died 78 days.	Spleen enormously enlarged and filled with caseous nodules up to 2 mm. Irregular grey foci in the liver. Moderately numerous caseating tubercles up to a millet seed in the cortices of kidneys. Caseous nodules around the margins of lungs and discrete tubercles in the substance. Caseous nodules in bronchial glands and bone marrow of ribs and in ovaries. Areolar tissues contained caseating tubercles. Joints not enlarged. Numerous tubercle bacilli in the spleen, a few in liver, and very numerous in the bone-marrow.

A. VIII.	Original material (Spleen of a fowl).	1717	1,200	850	April 7, 1908	22 days old, 8th generation.	501 days	0·00001 mg.	Died 100 days.	Cause of death not obvious. Spleen was small, and contained a moderate number of yellow gritty tubercles the size of rape seed. A few greyish-white foci in the liver. Three caseous tubercles and a caseous streak in each kidney. The lung showed in the posterior thirds firm yellow caseous areas; caseous nodules with grey margins in the anterior lobes, and scattered tubercles in the rest of the parenchyma.
A. VIII.	Original material (Spleen of a fowl).	1721	1,650	1,000	April 7, 1908	22 days old, 8th generation.	501 days	0·0000001 mg.	Died 198 days.	Spleen, quite small, contained one yellow caseo-calcareous grain. Liver normal. In each kidney there were two minute opaque foci. Lung tissue a little oedematous showed sparsely scattered minute caseous tubercles. Left bronchial gland caseo-calcareous. Other lymphatic glands normal. The right shoulder joint, left elbow and both ankle joints were swollen and distended with soft caseous substance and there were saccular protrusions around: several small joints of the feet were similar. Moderately numerous T.B. in smears from the spleen tubercle and joint.

INTRAVENOUS INOCULATIONS OF RABBITS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM SWINE.

P. II.	Original material (Submaxillary gland of a pig).	291	710	540	May 3, 1905	33 days old, 3rd generation.	55 days	1·0 mg.	Died 14 days.	Spleen not enlarged. Liver substance contained numerous irregular greyish-white foci. Kidneys normal. The lung tissue showed sparsely scattered grey tubercles, a few slightly opaque in the centre; patches of consolidation in anterior lobes. In the smears from the liver, spleen, and bone marrow there were very numerous tubercle bacilli.
P. III.	Original material (Submaxillary gland of a pig).	334	550	460	June 15, 1905	21 days old, 5th generation.	98 days	1·0 mg.	Died 17 days.	Spleen slightly enlarged. Other organs appeared normal. Bronchial glands oedematous. Very numerous tubercle bacilli in smear preparations from liver, marrow, spleen, and bronchial glands, moderately numerous in lung, and a few in kidney.
P. III.	Original material (Submaxillary gland of a pig).	443	1,150	820	September 7, 1907.	21 days old, 10th generation.	182 days	1·0 mg.	Died 21 days.	Spleen greatly enlarged and mottled with confluent greyish-white foci. Liver and kidneys normal. Lungs slightly congested. An opaque focus in a bronchial gland, and a few in the ventral mediastinal glands. Very numerous tubercle bacilli in smear preparations.
P. XXVII.	Original material (Submaxillary gland of a pig).	775	1,340	970	February 22, 1906.	21 days old, 4th generation.	73 days	1·0 mg.	Died 25 days.	Result similar to that in Rabbit 334, except that the spleen was much larger.
P. XLIV.	Original material (Submaxillary gland of a pig).	1182	2,000	1,370	January 4, 1907.	22 days old, 5th generation.	190 days	1·0 mg.	Died 32 days.	Spleen enormously enlarged, 12·5 by 2·5 cm., and mottled with confluent greyish-white foci. Numerous grey points in the liver. Kidneys pale. Lungs congested and oedematous. Ventral mediastinal glands enlarged. A few minute opaque tubercles on the peritoneum.
P. XLIV.	Original material (Submaxillary gland of a pig).	1186	1,040	700	January 4. 1907.	22 days old, 5th generation.	190 days	0·1 mg.	Died 25 days.	Spleen slightly enlarged. Kidneys and liver normal in appearance. The lungs were a little congested and contained a few grey nodules up to a hemp seed, opaque in the centre from which a pure culture of avian tubercle bacilli was obtained. Bronchial glands enlarged and oedematous. Smear preparations from the spleen and liver showed very large numbers of tubercle bacilli.

INTRAVENOUS INOCULATIONS OF RABBITS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM SWINE—*continued.*

Virus.	Source of Culture.	Number of Rabbit.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
P. III.	Original material (Submaxillary gland of a pig).	**444**	1,180	940	September 7, 1905.	21 days old, 10th generation.	182 days	0·01 mg.	Died 41 days.	Spleen enormously enlarged and surface closely speckled with opaque foci. On section the substance was firm and showed irregular yellowish-grey areas and very numerous grey points. Greyish white foci in the liver. Kidneys normal. In the lungs which were pink and crepitant were two caseating miliary tubercles. Numerous confluent caseating tubercles in the bone marrow. Opaque foci in portal and mesenteric glands. Other lymphatic glands normal. Numerous tubercle bacilli in smear preparations from spleen, liver, lung, marrow, and bronchial gland.
P. III.	Original material (Submaxillary gland of a pig).	**1617**	2,800	1,970	January 29, 1905.	21 days old, 27th generation.	1,056 days	0·01 mg.	Killed 23 days.	Animal killed on account of broken leg. The spleen was a little enlarged and the lungs were oedematous. Smear from spleen showed numerous tubercle bacilli.
P. XXI.	Original material (Submaxillary gland of a pig).	**879**	1,490	1,000	May 22, 1906	21 days old, 8th generation.	169 days	0·01 mg.	Died 30 days.	Spleen and liver showed numerous grey points. Kidneys normal. Lungs were congested and emphysematous and the interlobular network was well marked. Opaque foci in the portal, bronchial, submaxillary, and a dorsal mediastinal gland. Other glands normal.
P. XLIV.	Original material (Submaxillary gland of a pig).	**1181**	1,080	850	January 4, 1907.	22 days old, 5th generation.	190 days	0·01 mg.	Died 53 days.	Spleen swollen and filled with minute greyish white tubercles. Numerous grey foci in the liver. Kidneys pale. Lungs oedematous, anterior lobes grey and solid, and speckled with greyish white foci. Numerous tubercles in the bone marrow and a few in the areolar tissues.
P. III.	Original material (Submaxillary gland of a pig).	**1616**	2,620	1,500	January 29, 1908.	21 days old, 27th generation.	1,056 days	0·001 mg.	Died 166 days.	In the spleen there was a soft caseous miliary tubercle. Liver normal. In the cortices of the kidneys there were a few grey tubercles with caseous centres and a nodule (not projecting) the size of a pea; there were caseous streaks in the pyramids. The lungs showed a few caseating nodules on the surfaces and in the margins. Right elbow and ankle joints filled with soft caseous substance. Soft caseous nodules in the testes and on the spermatic cords.
P. XXI.	Original material (Submaxillary gland of a pig).	**880**	1,520	1,300	May 22, 1906	21 days old, 8th generation.	169 days	0·001 mg.	Killed 140 days.	Spleen, enlarged, contained numerous yellowish tubercles up to a millet seed, some appreciably gritty. The cortices of the kidneys were pitted and showed scattered grey tubercles with caseous centres up to a millet seed; numerous caseous streaks in the medullae. In the liver were scattered caseating submiliary tubercles. Lungs congested and oedematous, margins of the lobes caseated and a few irregular caseous tubercles in the parenchyma. Caseous tubercles in wall of large intestine, in the muscles and in the mesenteric glands. Left knee joint swollen and filled with soft caseous substance.

P. XXI.	Original material (Submaxillary gland of a pig).	881	2,200	1,250	May 22, 1906	21 days old, 8th generation.	169 days	0·0001 mg.	Killed 139 days.	Spleen slightly enlarged contained moderately numerous yellowish gritty tubercles, the size of rape seed. Three grey tubercles with opaque centres in the kidneys. In the liver there were scattered yellowish miliary tubercles. The lungs contained a few grey tubercles with opaque centres and a caseous nodule in the margin of a caudal lobe. Two soft caseous nodules in the subcutaneous tissues. Caseation of mediastinal, inguinal, and axillary glands. Lumbar, iliac, and mesenteric glands showed no tubercles. Knee joints and shoulder joints swollen and filled with caseo-pus. Numerous tubercle bacilli in the joints, skin nodules and spleen.

INTRAPERITONEAL INOCULATIONS OF RABBITS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM BIRDS.

A. I.	Original material (Intestine of a touracou).	835	1,420	900	April 26, 1906	21 days old, 4th generation.	70 days	1·0 mg.	Died 25 days.	Omentum slightly thickened along the free margin. Numerous whitish tubercles on the mesentery, meso-colon and dorsal parietal peritoneum. Spleen swollen and packed with grey foci. Numerous grey points just visible in the liver substance. Kidneys pale. Lungs pink and crepitant showed on the surface numerous translucent foci occasionally with opaque centres. Caseation of sternal, mediastinal, and iliac glands.
A. II.	Original material (Spleen of a pigeon).	885	1,450	1,000	May 22, 1906	21 days old, 4th generation.	69 days	1·0 mg.	Died 11 days.	No visible lesions: numerous tubercle bacilli in the spleen, a few in the liver.
A. III.	Original material (Lung of a demoiselle crane).	1237	1,580	920	February 6, 1907.	22 days old, 4th generation.	315 days	1·0 mg.	Killed 211 days.	In omentum there were five small tubercles. Four flattened caseous nodules on ligament of liver. Spleen and liver normal. Kidneys showed a few caseating nodules up to a hempseed. Lungs oedematous, two small caseous nodules in margin of right anterior lobe, a few caseous nodules on pleura and pericardium. Both knee joints and left elbow were filled with soft caseous substance. Inoculation partly intra-caecal.
A. IV.	Original material (Liver of a pheasant).	964	1,440	1,900	July 4, 1906	22 days old, 4th generation.	89 days	1·0 mg.	Died 171 days.	Omentum normal. Spleen normal. A single tubercle in the liver. Lungs were pink but a little oedematous and congested around margins; in the substance were scattered caseating tubercles up to a rape seed. Scattered caseating tubercles up to a millet seed in the cortices of kidneys and caseous streaks in the pyramids. Caseous nodule in the caecum. Both elbow joints, one wrist and one knee joint were enlarged and filled with caseous substance.
A. V.	Original material (Spleen of a pheasant).	959	1,450	1,010	July 4, 1906	22 days old, 4th generation.	88 days	1·0 mg.	Died 28 days.	Omentum slightly thickened. Numerous transparent foci just visible on the colon, meso-colon, and parietal peritoneum. Spleen greatly swollen and closely filled with greyish white foci; Malpighian bodies enlarged. Liver pale. The cortices of kidneys showed numerous translucent foci some opaque in the centre. Lungs crepitant; interlobular tissue thickened; the substance showed occasional grey tubercles with opaque centres. Caseation of bronchial, sternal, and portal glands.

INTRAPERITONEAL INOCULATIONS OF RABBITS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM BIRDS—*continued.*

Virus.	Source of Culture.	Number of Rabbit.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
A. VI.	Original material (Spleen of a pheasant).	**1485**	1,730	1,160	September 21, 1907.	21 days old, 6th generation.	529 days	1·0 mg.	Died 59 days.	Omentum thickened, translucent and beset with caseous foci and nodules. Numerous yellowish white tubercles on dorsal parietal peritoneum and on mesentery. Spleen swollen, patches of fibrin on surface ; substance beset with grey points. Liver normal. Surface of kidneys covered with numerous irregular pits at the bottom of which the tissue was dark grey and where there were occasionally caseous tubercles. Lungs pink and oedematous ; scattered caseous tubercles on the surface. Mediastinal and lumbar glands caseous. Numerous caseous tubercles in the subcutaneous tissues.
A. VII.	Original material (Spleen of a fowl).	**1280**	1,220	870	March 12, 1907	21 days old, 4th generation.	112 days	1·0 mg.	Died 17 days.	Omentum very slightly thickened and retracted. Peritoneum normal. Grey points just visible beneath the surfaces of liver and spleen. Kidneys pale. Lungs collapsed normally, they were a little oedematous and one was congested. Mediastinal glands partly caseous.
A. VIII.	Original material (Spleen of a fowl).	**1351**	1,270	950	May 28, 1907	21 days old, 4th generation.	186 days	1·0 mg.	Died 22 days.	Result similar to that in Rabbit 1280.
A. X.	Original material (Lung of a fowl).	**1359**	920	600	May 30, 1907	21 days old, 4th generation.	121 days	1·0 mg.	Died 29 days.	Omentum moderately thickened, translucent, and beset with caseous foci. Minute translucent foci on caecum, peritoneum, and mesentery. Spleen, quite small, showed a few grey points. Moderately numerous grey foci in liver. The cortices of kidneys contained numerous minute tubercles with caseating centres. Lungs closely filled with translucent tubercles with caseous centres ; anterior lobes almost solid. Mediastinal glands caseous. Other glands normal.
A. III.	Original material (Lung of a demoiselle crane).	**992**	900	630	July 14, 1906	22 days old, 4th generation.	108 days	0·1 mg.	Died 39 days.	Omentum slightly thickened ; patches of grey tubercles on peritoneum, mesentery, and meso-colon. Spleen normal. Liver showed moderately numerous minute grey foci. On the surfaces of the kidneys there were numerous irregular pits and a few opaque foci. Lungs, slightly oedematous, contained moderately numerous translucent foci, a few opaque in the centre. Mediastinal glands caseous. Tubercles in lumbar, iliac, and mesenteric glands.
A. IV.	Original material (Liver of a pheasant).	**965**	1,200	980	July 4, 1906	22 days old, 4th generation.	89 days	0·1 mg.	Died 41 days.	Result similar to that in Rabbit 992, except that the spleen and liver contained numerous greyish-white foci, and the lungs showed more numerous caseating tubercles.
A. VI.	Original material (Spleen of a pheasant).	**1486**	1,590	1,100	September 21, 1907.	21 days old, 6th generation.	529 days	0·1 mg.	Died 85 days.	Omentum thickened and caseated. Numerous greyish-white tubercles on the peritoneum and mesentery. Spleen enclosed in an opaque capsule studded with tubercles ; the pulp contained discrete yellow miliary tubercles. Numerous grey points in the liver. Numerous tubercles up to a millet seed in the kidneys. The lungs showed scattered submiliary tubercles and a few caseous nodules in the margins. Caseous tubercles in lumbar, iliac, portal, and mediastinal glands. Right wrist, elbow, and knee joints swollen and filled with caseous substance.

A. V.	Original material (Spleen of a pheasant).	**960**	820	1,550	July 4, 1906	22 days old, 4th generation.	88 days	0·01 mg.	Killed 198 days.	A few nodules on omentum and peritoneum and one on caecum. Spleen, liver, kidneys, and testes normal. In each lung there were three or four minute caseating tubercles. Caseous gritty foci in a mediastinal gland. Right elbow, ankle, and both knee joints filled with soft caseous substance.

INTRAPERITONEAL INOCULATIONS OF RABBITS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM SWINE.

P. II.	Original material (Submaxillary gland of a pig).	**294**	1,040	860	May 3, 1905	33 days old, 3rd generation.	55 days	50·0 mg.	Died 13 days.	Omentum retracted, thickened along free margin and composed of pinkish translucent tissue beset with whitish foci and streaks. Parietal peritoneum normal. A few tubercles on the meso-colon and liver. Spleen enlarged and speckled with minute foci. Liver and kidneys pale. Lungs pink and crepitant. Caseation of sternal and bronchial glands. Caseous nodule in a portal gland. Other glands normal. Numerous tubercle bacilli in sternal gland, spleen, and liver.
P. III.	Original material (Submaxillary gland of a pig).	**331**	920	710	June 15, 1905	20 days old, 5th generation.	98 days	5·0 mg.	Died 9 days.	No lesions visible beyond slight enlargement of sternal glands which contained swarms of tubercle bacilli. Tubercle bacilli in blood and spleen.
P. II.	Original material (Submaxillary gland of a pig).	**292**	1,060	700	May 3, 1905	33 days old, 3rd generation.	55 days	1·0 mg.	Died 22 days.	Omentum slightly thickened and composed of translucent tissue. Numerous tubercles on peritoneum, mesentery, and meso-colon. Spleen enlarged and beset with greyish white foci. Numerous grey points in the liver and dark grey tubercles in the kidneys of which a few were caseating. Lungs congested and filled with grey tubercles, a few opaque in the centre. Caseation of sternal, portal, and coeliac glands. Opaque foci in bronchial, mesenteric, and iliac glands. Very numerous tubercle bacilli in the liver, spleen, lungs, and sternal glands.
P. II.	Original material (Submaxillary gland of a pig).	**471**	1,320	1,040	September 25, 1905.	23 days old, 11th generation.	200 days	1·0 mg.	Died 34 days.	The appearances were the same as in Rabbit 292 except that there were only a few foci visible in the liver and none in the spleen.
P. III.	Original material (Submaxillary gland of a pig).	**333**	370	360	June 15, 1905	21 days old, 5th generation.	98 days	1·0 mg.	Died 5 days.	No lesions visible. Numerous tubercle bacilli in the spleen and peritoneal fluid, and a few in the liver.
P. XXI.	Original material (Submaxillary gland of a pig).	**774**	2,430	1,590	February 19, 1906.	21 days old, 4th generation.	77 days	1·0 mg.	Died 29 days.	The appearances were the same as in Rabbit 292, except that there were no definite foci visible in the liver.
P. XXVII.	Original material (Submaxillary gland of a pig).	**776**	1,420	1.100	February 22, 1906.	21 days old, 4th generation.	73 days	1·0 mg.	Died 20 days.	Omentum moderately thickened. Spleen enlarged and beset with greyish white foci. Numerous grey points in the liver. Kidneys pale. Lungs were crepitant and showed scattered transparent foci. Cortex of mediastinal gland a little opaque.

INTRAPERITONEAL INOCULATIONS OF RABBITS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM SWINE—*continued.*

Virus.	Source of Culture.	Number of Rabbit.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
P. XLIV.	Original material (Submaxillary gland of a pig).	**1183**	1,800	1,270	January 24, 1907.	22 days old, 5th generation.	190 days	1·0 mg.	Died 37 days.	Result the same as in Rabbit 292, except that there were only a few translucent foci in the lungs.
P. II.	Original material (Submaxillary gland of a pig).	**472**	1,240	980	September 25, 1905.	23 days old, 11th generation.	200 days	0·1 mg.	Died 30 days.	Result similar to that in Rabbit 292, except that the kidneys were normal in appearance.
P. XLIV.	Original material (Submaxillary gland of a pig).	**1184**	1,300	1,250	January 4, 1907.	22 days old, 5th generation.	190 days	0·1 mg.	Killed when ill 117 days.	In omentum and on peritoneum were a few discrete opaque gritty tubercles. Spleen and liver normal. In left kidney there was a caseous miliary tubercle. In the margins of the lungs there were a few caseous nodules and an occasional tubercle beneath the pleura. Testes normal. Grey focus in a suprarenal body. Gritty foci in a mediastinal and lumbar gland. Left elbow and both knee joints swollen and filled with caseous substance.

SUBCUTANEOUS INOCULATIONS OF RABBITS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM BIRDS.

A. VI.	Original material (Spleen of a pheasant).	**1488**	1,200	820	September 21, 1907.	21 days old, 6th generation.	529 days	50·0 mg.	Died 52 days.	Firm caseous tumour beneath fascia covering muscles of the back and infiltrating the intercostal muscles. Caseous foci in axillary glands. Spleen, slightly enlarged, contained numerous yellowish rape seed tubercles. Scattered grey points in the liver. Numerous submiliary caseating tubercles in the cortices of the kidneys. The lungs were congested and oedematous, and contained a moderate number of discrete caseating tubercles and a caseous patch on the dorsal surface of left lung. Caseation of bronchial and mediastinal glands, and caseous foci in the lumbar. Tubercles in axillary and retro-peritoneal tissues.
A. II.	Original material (Spleen of a pigeon).	**1260**	1,700	1,400	March 1, 1907	20 days old, 9th generation.	352 days	50·0 mg.	Died 81 days.	In the subcutaneous tissue of back there was a caseo-necrotic tumour the size of a pheasant's egg. Nearest gland partly caseous. Spleen normal. Scattered grey foci in the liver. In the cortices of the kidneys there were numerous grey tubercles with caseous centres up to a millet seed, and caseous streaks and tubercles in the pyramids. The lungs showed scattered caseous tubercles and caseation of the margins; right anterior and middle lobes firm and reddish-grey. Caseous foci in mediastinal glands and a lumbar gland. Caseous nodules in the testes. Caseous substance in left shoulder joint.

A. II.	Original material (Spleen of a pigeon).	884	1,490	1,550	May 22, 1906	21 days old, 4th generation.	69 days	10·0 mg.	Killed, ill, 143 days.	Large cyst in subcutaneous tissue filled with caseo-pus; no ulcer in the skin. Left axillary gland caseous and softening, right partly caseous. Spleen and liver normal. Each kidney contained a few soft caseous miliary tubercles with grey margins. Caseo-calcareous tubercle in a suprarenal body. The lungs showed a few caseous nodules and tubercles. Caseation of mediastinal and mesenteric glands. Both elbow and one knee joint distended with caseo-pus. Animal killed on account of joint disease. Cultures from lung and kidney were avian.
A III.	Original material (Lung of a demoiselle crane).	988	1,530	1,700	July 14, 1906	22 days old, 4th generation.	108 days	10·0 mg.	Died 157 days.	Caseous and softening tumour, size of thrush's egg. Spleen and liver normal. In right kidney there was a line of tubercles extending through the cortex. Lungs grey and solid and pleural cavities filled with fluid (no T.B.). Three limb joints affected. No tuberculosis of lymphatic glands. Death from acute pleurisy, not tuberculous. Culture from kidney was avian.
A. III.	Original material (Lung of a demoiselle crane).	989	1,630	1,350	July 14, 1906	22 days old, 4th generation.	108 days	10·0 mg.	Died 93 days.	Post-mortem appearances similar to those in Rabbit 884. Seven limb joints filled with soft caseous substance. Culture from axillary gland was avian.
A. IV.	Original material (Liver of a pheasant).	961	1,150	900	July 4, 1906	22 days old, 4th generation.	89 days	10·0 mg.	Died 140 days.	Post-mortem appearances similar to Rabbit 884. Both elbow, knee, and ankle joints and several meta-tarsal joints were swollen and filled with soft caseous substance.
A. IV.	Original material (Liver of a pheasant).	962	1,020	2,150	July 4, 1906	42 days old, 4th generation.	89 days	10·0 mg.	Killed 104 days.	Post-mortem appearances resembled those in Rabbit 884 except that the cyst had discharged through an ulcer in the skin. None of the joints was affected.
A. V.	Original material (Spleen of a pheasant).	956	920	850	July 4, 1906	22 days old, 4th generation.	88 days	10·0 mg.	Died 52 days.	Large and septic caseous ulcer in the skin of the back. A single opaque tubercle in the spleen. The kidneys contained fairly numerous caseating tubercles. In the lung substance there were a few transparent foci and a few tubercles in the margins. Caseation of bronchial and mediastinal glands. Death due probably to toxaemia from septic ulcer.
A. V.	Original material (Spleen of a pheasant).	957	1,150	2,250	July 4, 1906	22 days old, 4th generation.	88 days	10·0 mg.	Killed 168 days.	Lesions resembled those in Rabbit 884, except that there was no caseation of the lymphatic glands, and there were a few tubercles in the liver. Smear preparations of lung, liver and kidney, showed a few tubercle bacilli.
A. I.	Original material (Intestine of a touracou).	1088	600	800	November 22, 1906.	22 days old, 8th generation.	280 days	1·0 mg.	Died 86 days.	Lesions resembled those in Rabbit 877, but they were complicated by the presence of pseudo-tuberculosis of the spleen and kidneys, verified by cultures. Numerous tubercle bacilli in lung substance. Death from pseudo-tuberculosis.
A. VII.	Original material (Spleen of a fowl).	1281	1,620	1,580	March 12, 1907	21 days old, 4th generation.	112 days	1·0 mg.	Died 165 days.	Caseous tumour the size of thrush's egg and small ulcer in the skin of the back. Axillary glands filled with caseo-pus. A single caseous tubercle in the medulla of right kidney. Lungs normal except for a flattened caseous nodule in the margin of right anterior lobe. Spleen, liver, joints and the other lymphatic glands were normal. Death due to septic cellulitis of back from injuries.

SUBCUTANEOUS INOCULATIONS OF RABBITS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM BIRDS—*continued.*

Virus.	Source of Culture.	Number of Rabbit.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
A. X.	Original material (Lung of a fowl).	**1357**	1,140	1,260	May 30, 1907	21 days old, 4th generation.	121 days	1·0 mg.	Died 176 days.	Small caseo-purulent cyst in subcutaneous tissues of back. Axillary gland enlarged; no caseation. Spleen normal. Liver normal. A few tubercles up to a millet seed in the kidneys. A few minute translucent and four miliary tubercles with opaque centres in the lungs. Lymphatic glands normal. Both ankle, both wrist, and one elbow joint were tuberculous.
A. VI.	Original material (Spleen of a pheasant).	**1487**	1,220	1,320	September 21, 1907.	21 days old, 6th generation.	529 days	0·1 mg.	Died 267 days.	Cystic caseous nodule in subcutaneous tissue. Lymphatic glands, spleen and liver normal. About two-thirds of right kidney contained projecting caseous nodules which extended as caseous streaks through the pyramids; in the left kidney were a few pits and a single caseating tubercle. Lungs showed a few caseating miliary tubercles. Left wrist and right ankle joints tuberculous.
A. VIII.	Original material (Spleen of a fowl).	**1350**	1,050	1,650	May 28, 1907	21 days old, 4th generation.	186 days	0·01 mg.	Died 153 days.	Yellow caseous nodules in the subcutaneous tissues at the seat of inoculation. Caseo-calcareous nodule in an axillary gland. Spleen and liver normal. A few caseating tubercles up to a millet seed in the kidneys. Lungs showed a few caseating tubercules and one marginal nodule. Gritty tubercle in a bronchial gland. Grey tubercle in a suprarenal body. Intestines, ovaries and areolar tissues and the other lymphatic glands normal. Both wrist and ankle joints distended with caseo-pus.
A. VIII.	Original material (Spleen of a fowl).	**1349**	1,080	1,220	May 28, 1907	21 days old, 4th generation.	186 days	0·001 mg.	Killed, dying 258 days.	Several small cysts in subcutaneous tissue filled with caseo-pus. A few opaque foci in scapular and axillary glands. Spleen normal. A few greyish white foci in the liver. The cortex of the kidneys contained numerous caseating tubercles the size of rape seeds, the majority slightly depressed and with caseous streaks in pyramids; there was also a large grey nodule 1·3 cm. in diameter beset with caseous foci. Lungs congested; margins replaced by caseated tissue and numerous caseating tubercles in the substance. Caseous focus in one mediastinal gland. Caseous nodules in testes and epididymes. The majority of the limb joints were swollen and filled with soft caseous substance.
A. VIII.	Original material (Spleen of a fowl).	**1348**	1,000	2,370	May 28, 1907	21 days old, 4th generation.	186 days	0·0000001 mg.	Killed 305 days.	Animal was healthy when killed. No local lesion or other sign of tuberculosis. The fowl inoculated with 0·000001 mg. of the same culture emulsion developed a local lesion and general tuberculosis; that with an equivalent dose of the same dilution as this rabbit showed tuberculosis of liver and spleen but no local lesion.

SUBCUTANEOUS INOCULATIONS OF RABBITS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM SWINE.

P. II.	Original material (Submaxillary gland of a pig).	883	1,620	1,900	May 22, 1906	21 days old, 24th generation.	439 days	50·0 mg.	Died 129 days.	Large cystic tumour filled with caseo-pus under skin of back. Axillary glands enlarged. Scattered minute grey tubercles with opaque centres in liver (no T.B.). A caseous streak in the cortex of one kidney and a tubercle in the pyramids. Lungs pink and crepitant contained sparsely scattered caseating tubercles up to a pin-head ; in the margin there was a reddish grey nodule beset with caseous foci. Lymphatic glands normal. Kidney and liver showed no tubercle bacilli. Culture from lung nodule was avian in type.
P. XXI.	Original material (Submaxillary gland of a pig).	876	2,270	1,600	May 22, 1906	21 days old, 8th generation.	169 days	50·0 mg.	Died 163 days	Ulcer in skin over a large caseous tumour softening in the centre. Minute opaque foci in enlarged axillary glands. Spleen normal. An occasional minute grey tubercle in kidneys. Caseous nodules in the margins of the lungs and scattered minute grey tubercles in the substance. The majority of the limb joints were swollen and filled with caseo-pus. Caseous nodules in the intestine, confluent in the blind end of caecum and ileo-caecal dilatation. Cultures from lung and elbow joint avian in type.
P. XXI.	Original material (Submaxillary gland of a pig).	877	2,320	1,700	May 22, 1906	21 days old, 8th generation.	169 days	10·0 mg.	Died 92 days.	Local lesion was a large firm caseous mass within a fibrous capsule. Soft caseous nodules in axillary glands. Spleen normal. Two grey foci in liver. Small caseous tubercle in right kidney. Lungs slightly congested and oedematous contained caseous nodules in the margins. A few tubercles in the intestine and blind end of caecum containing tubercle bacilli. Caseous nodules in ventral mediastinal glands ; other lymphatic glands normal. Death from cellulitis due to wounds.
P. XLIV.	Original material (Submaxillary gland of a pig).	1185	1,100	1,000	January 4, 1907	22 days old, 5th generation.	190 days	10·0 mg.	Died 69 days.	Local lesion was a caseo-purulent cyst. Axillary glands partly caseous. Moderately numerous caseating tubercles up to a millet seed in the kidneys. Spleen and liver normal. Lungs, pink and crepitant, showed scattered minute caseating tubercles and a few nodules in the margins. Mediastinal glands partly caseous. Tubercles in the axillary and inguinal regions. Death from hæmorrhage due to fighting.
P. II.	Original material (Submaxillary gland of a pig).	326	1,000	840	June 14, 1905	21 days old, 5th generation.	97 days	5·0 mg.	Died 69 days.	Caseo-necrotic mass in subcutaneous tissue of abdomen and an ulcer in the skin. Spleen contained one minute yellow tubercle. Liver showed a few opaque tubercles containing tubercle bacilli. Cortices of kidneys contained numerous caseating miliary tubercles. Lungs showed moderately numerous caseating tubercles up to a pin-head, and a few small nodules. Inguinal, iliac, bronchial, and ventral mediastinal glands caseous. Caseous foci in mesenteric glands, blind end of caecum, and dilatation of ileum containing tubercle bacilli.
P. III.	Original material (Submaxillary gland of a pig).	330	920	810	June 21, 1906	21 days old, 5th generation.	98 days	5·0 mg.	Died 9 days.	At the seat of inoculation in subcutaneous tissues of abdomen, the tissues were congested and oedematous. No other lesion visible. Numerous tubercle bacilli in inguinal gland, and a few in the iliac.
P. II.	Original material (Submaxillary gland of a pig).	293	1,150	1,100	May 3, 1905	33 days old, 3rd generation.	55 days	1·0 mg.	Died 149 days.	No local lesion visible. A yellow tubercle in an inguinal gland. Spleen and liver normal. In the kidneys there were two minute tubercles, and one grey tubercle with a soft caseous centre. Lungs, normal in appearance, contained four caseating tubercles 1 mm. in diameter. In the intestines there were numerous caseous nodules projecting on the peritoneal surface, and hollow and ulcerated internally ; these contained numerous tubercle bacilli. Animal had evidently eaten its local lesion.

SUBCUTANEOUS INOCULATIONS OF RABBITS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM SWINE—*continued.*

Virus.	Source of Culture.	Number of Rabbit.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
P. II.	Original material (Submaxillary gland of a pig).	**882**	1,470	2,620	May 22, 1906	21 days old, 24th generation.	439 days	1·0 mg.	Killed 198 days.	Cystic local lesion filled with caseo-pus. Spleen, liver, kidneys, and lymphatic glands normal. Lungs a little oedematous. Right wrist joint was swollen and contained soft caseous substance. Culture from joint was avian in type.
P. XXI.	Original material (Submaxillary gland of a pig).	**878**	1,770	1,850	May 22, 1906	21 days old, 8th generation.	169 days	1·0 mg.	Died 155 days.	Caseo-purulent cyst at the seat of inoculation. Gritty foci in the nearest gland. Spleen and liver enlarged showed no tubercles. On the surface of the kidneys there were numerous irregular translucent foci, some with opaque centres. Lungs were congested and oedematous and were closely filled with grey tubercles with opaque centres not larger than rape seed; there was slight caseation of the margins of the lungs. A few caseous foci in the bronchial glands. Other lymphatic glands normal. Right shoulder, both ankle and left wrist joints tuberculous. Spleen showed no tubercle bacilli in smear preparations, kidney a few, and joint numerous. Culture from lung avian in type.
P. XXVII.	Original material (Submaxillary gland of a pig).	**777**	1,640	1,930	February 22, 1906.	21 days old, 4th generation.	73 days	1·0 mg.	Killed 91 days.	Local lesion was a caseo-purulent cyst. Spleen, liver, kidneys, and lymphatic glands normal. In the right cephalic lobe just beneath the pleura there was a firm reddish grey nodule 8 by 6 mm. beset with discrete caseous foci. Culture from lung nodule was avian in type.

FEEDING EXPERIMENTS ON RABBITS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM BIRDS.

A. II.	Original material (Spleen of a pigeon).	**1262**	1,800	1,240	March 1, 1907	20 days old, 9th generation.	352 days	50·0 mg.	Died 59 days.	In each tonsil there was a deep caseous ulcer 2 mm. in diameter. Each submaxillary gland contained a few soft irregular caseous foci. Each superior cervical gland was partly caseous; caseous foci in other cervical glands and in the mesenteric glands. Each Peyer's patch contained several ulcers up to 2 mm., lined by soft caseous substance. The blind end of caecum and dilated end of ileum showed layers of soft caseous substance beneath the peritoneum. The kidneys showed discrete depressed caseous miliary tubercles. Sparsely scattered tubercles in the lungs. Caecum and mesenteric gland showed numerous tubercle bacilli, tonsillar and intestinal ulcers a few. Kidney tubercles showed cocci and no tubercle bacilli.
A. I.	Original material (Intestine of a touracou).	**833**	1,000	1,930	April 26, 1906	21 days old, 4th generation.	70 days	10·0 mg.	Killed 161 days.	Two or three caseous foci in the submaxillary glands. Gritty tubercles in the mesenteric glands, and one in a cervical. Three soft tubercles in a Peyer's patch, and collections of secretion in the blind end of caecum. Two minute grey tubercles in the lungs. No tuberculosis elsewhere.

A. I.	Original material (Intestine of a touracou).	1089	690	920	November 22. 1906.	22 days old, 8th generation.	280 days	10·0 mg.	Died 179 days.	Tonsils, pharynx, submaxillary, and mesenteric glands normal. The lungs showed on the surface scattered caseating tubercles and a few marginal nodules. Both elbow, one wrist, and one ankle joint were filled with caseous substance. No tuberculosis elsewhere.
A. II.	Original material (Spleen of a pigeon).	1261	1,650	1,080	March 1, 1907	20 days old, 9th generation.	352 days	10·0 mg.	Died 217 days.	Caseous patches in submaxillary glands. In the last part of the small intestine there were four large pea-sized nodules projecting peritoneally and communicating with the gut by small apertures. Three caseous nodules in the caecum, and areas of soft yellowish substance in the blind end of caecum. In each kidney there was a reddish-grey depressed area beset with caseous foci, which passed through the pyramids as caseous streaks; also a few minute tubercles. A few translucent foci in the lungs. A caseous tubercle in the axillary and a bronchial gland, and discrete tubercles in the connective tissues. Both knee joints, a shoulder, and an elbow joint were tuberculous.
A. VII.	Original material (Spleen of a fowl).	1282	1,750	1,120	March 12, 1907	21 days old, 4th generation.	112 days	10·0 mg.	Died 91 days.	In each tonsil there was an ulcer 1 cm. in diameter with a thick caseous base. Submental, submaxillary, and cervical glands caseous. A few mesenteric glands showed caseous streaks. In the small intestine there were numerous caseous nodules, at one part twenty-eight to four inches of gut; they projected peritoneally and were ulcerated internally varying from 4 mm. to 1 cm. in diameter. Numerous nodules in the caecum and colon. Blind end of caecum and dilatation of ileum thick and caseous. A caseous tubercle in one kidney and a caseous streak in the other. Spleen and liver normal. Two caseating nodules in the lungs and a few translucent foci. Tubercle bacilli in tonsil, cervical and mesenteric glands, numerous in the caecum.
A. III	Original material (Lung of a demoiselle crane).	1238	1 520	2,750	February 6, 1907.	22 days old, 4th generation.	315 days	5·0 mg.	Killed 463 days.	In the wall of the blind end of the caecum there were several collections of soft yellowish substance; similar collections in the dilatation of the ileum. No tuberculosis elsewhere. Smear preparations showed moderately numerous tubercle bacilli in both caecum and ileum. Culture from blind end of caecum was avian in type.
A. I	Original material (Intestine of a touracou).	1090	670	1,020	November 22. 1906.	22 days old, 8th generation.	280 days	1·0 mg.	Died 163 days.	A tubercle in the mucous membrane of the larynx. Right posterior pharyngeal gland was caseous and softened. A few opaque foci in the small intestine. Two caseous nodules in the large intestine. In the kidneys there were minute irregular pits and a single opaque focus. In the lungs there were scattered caseating tubercles up to a millet seed, two calcareous, and a pea sized soft caseous nodule. Gritty nodule in a mediastinal gland. Right wrist joint tuberculous. No tuberculosis elsewhere. Numerous tubercle bacilli in pharyngeal and mediastinal glands and in larynx and lung nodule.

FEEDING EXPERIMENTS ON RABBITS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM SWINE.

Virus.	Source of Culture.	Number of Rabbit.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
P. XXI.	Original material (Submaxillary gland of a pig).	**1092**	740	1120	November 22, 1906.	22 days old, 11th generation.	353 days	**20·0** mg.	Died 195 days.	An opaque focus in left tonsil. Caseating tubercles on the larynx. Caseous tubercle in the frenum linguae. Caseous patch and a calcareous granule in left submaxillary gland. Small intestine showed two caseous nodules ulcerated internally 2·5 mm. in diameter and one in the large intestine; in the cæcum there was an ulcer with caseous base 3·5 mm. in diameter. Mesenteric glands, spleen and liver normal. In the cortex of each kidney there were a few grey caseating tubercles about the size of rape seed. Tubercles in the omentum and connective tissue and caseous nodules in a testis. Lungs showed a few caseous nodules in the margins; scattered tubercles in the substance. There was a septic abscess in the thigh. Smear preparations from tonsil showed a few tubercle bacilli, from the testis, colic ulcer and submaxillary gland numerous tubercle bacilli.
P. II.	Original material (Submaxillary gland of a pig).	**738**	2120	2150	February 8, 1906.	23 days old, 19th generation.	336 days	**10·0** mg	Killed 28 days.	Soft whitish focus in each tonsil. Three pinhead sized whitish tubercles in the left submaxillary gland and one in each mesenteric gland. A few whitish foci in three Peyer's patches, in the end of ileum and in the blind end of caecum. No tuberculosis elsewhere. Tonsil, Peyer's patch, ileum and caecum showed in smear preparations numerous tubercle bacilli; a few in mesenteric gland.
P. II.	Original material (Submaxillary gland of a pig).	**740**	1550	1800	February 8, 1906.	23 days old, 19th generation.	336 days	**10·0** mg.	Killed 56 days.	Tonsils showed whitish caseous streaks. Irregular caseous foci in each pharyngeal gland. A gritty tubercle in a mesenteric gland. A caseating tubercle in the left kidney. No tuberculosis elsewhere. Tubercle bacilli in secretion from blind end of caecum, mesenteric gland and tonsil. Culture from kidney was avian in type.
P. II.	Original material (Submaxillary gland of a pig).	**741**	1440	2000	February 8, 1906.	23 days old, 19th generation.	336 days	**10·0** mg.	Killed 84 days.	Tonsils and pharynx normal. A few tubercles in the submaxillary, pharyngeal and mesenteric glands, the latter gritty. In the ileum there were three small ulcers with caseous thickened bases and a few soft yellow foci in two Peyer's patches. The lungs contained twelve caseating tubercles up to 1 mm. in diameter. No tuberculosis elsewhere. Tubercle bacilli in ulcer and in mesenteric gland.
P. II.	Original material (Submaxillary gland of a pig).	**1131**	950	1,930	November 28, 1906.	23 days old, 26th generation.	629 days	**10·0** mg.	Died 76 days.	Caseation of each submaxillary and a right cervical gland. In the margin of an anterior lobe of the lung there was a caseating tubercle the size of a rape seed. No tuberculosis elsewhere. Tubercle bacilli in smear preparations from the secretion in the termination of the ileum and from the lung nodule.
P. III.	Original material (Submaxillary gland of a pig).	**1133**	800	1,000	November 28, 1906.	21 days old, 20th generation.	629 days	**10·0** mg.	Died 42 days.	Caseous patch in right submaxillary gland and a few minute opaque foci in the mesenteric glands. Both glands showed numerous tubercle bacilli. No tuberculosis elsewhere. Death due to septic cellulitis of the back.

P. XXI.	Original material (Submaxillary gland of a pig).	1091	720	1,340	November 22, 1906.	22 days old, 11th generation.	353 days	10·0 mg.	Died 86 days.	No sign of tuberculosis.
P. XLIV.	Original material (Submaxillary gland of a pig).	1180	1,040	1,630	January 4, 1907.	22 days old. 5th generation.	190 days	10·0 mg.	Died 323 days	Calcareous granules in submaxillary glands and a cervical gland. A few caseous foci in the small intestine. In the caecum there were twelve caseous nodules projecting on the peritoneal surface and ulcerated internally, the largest 4 by 2 cm. The blind end of caecum was thickened, wall caseous and ulcerated internally. Moderately numerous caseous tubercles in the cortices of kidneys up to a millet seed and also reddish pits with opaque foci at the bottom. Lung substance was fairly closely beset with caseous nodules with grey margins and the margins of the lobes were almost wholly caseous. Caseous nodule in each testis. Right elbow and left shoulder joints tuberculous. No tuberculosis elsewhere. Smears from caecum and ulcer in blind end of caecum showed a few tubercle bacilli.
P. XXVII.	Original material (Submaxillary gland of a pig).	778	1,230	1,180	February 22. 1906.	21 days old, 4th generation.	73 days	1·0 mg.	Died 159 days.	Calcareous grains in the mesenteric glands. Miliary nodule in the small intestine. Collections of viscid yellow substance in lymphoid tissue of blind end of caecum and ileum. Pea-sized yellow nodules in the mesentery of the caecal termination. Scattered pearly grey tubercles in the kidneys. No tuberculosis elsewhere. Death from pneumonia (not tuberculous). Tubercle bacilli in mesenteric gland, kidney, and secretion of end of caecum.
P. XLIV.	Original material (Submaxillary gland of a pig).	1179	1,550	2,550	January 4, 1907.	22 days old, 5th generation.	190 days	1·0 mg.	Killed 496 days.	No sign of tuberculosis.

INOCULATION EXPERIMENTS ON RABBITS WITH EMULSIONS OF TUBERCULOUS MATERIAL (AVIAN).

Virus.	Material used.	Number.	Weight in Grammes.		Date of Inoculation.	Duration of Life.	Method of Inoculation.	Result.
			Initial.	Final				
A. I.	Original material (Intestinal nodule of a touracou).	768	2,630	2,660	February 17, 1906.	Died 23 days.	Intraperitoneal	Acute tuberculosis. Spleen very large.
A. I.	Original material (Intestinal nodule of a touracou).	767	2,610	2,660	February 17, 1906.	Killed 76 days.	Subcutaneous	Small ulcer over caseo-purulent cyst. Soft caseous nodule in an inguinal gland. No disease elsewhere.
A. III.	Original material (Lung of a crane).	813	1,400	2,110	March 28, 1906	Killed 94 days.	Subcutaneous	Caseo-purulent cyst under the skin of the back. No tuberculosis elsewhere.

INOCULATION EXPERIMENTS ON RABBITS WITH EMULSIONS OF TUBERCULOUS MATERIAL (AVIAN)—*continued.*

Virus.	Material used.	Number.	Weight in Grammes.		Date of Inoculation.	Duration of Life.	Method of Inoculation.	Result.
			Initial.	Final.				
A. IV	Omentum of Guinea-pig 2550.	1610	1,860	2,300	January 14, 1908	Killed 121 days.	Intravenous	No tuberculosis.
A. V.	Liver nodule of Guinea-pig 2924.	1740	1,050	2,500	April 14, 1908	Killed 114 days.	Intravenous	Animal in good condition. In the spleen there were three soft caseous gritty nodules (T.B.) from a millet to a hemp seed in size. Minute tubercle in one kidney. No tuberculosis elsewhere. Cultures from spleen and kidney were avian in type.
A. V.	Omentum of Guinea-pig 2408.	1361	1,750	3,000	June 5, 1907	Killed 177 days.	Intraperitoneal	A few miliary tubercles in the omentum. In the tunica vaginalis of the left testis there were flattened caseous nodules up to 6 mm. in diameter. A left tarsal joint was swollen and filled with soft caseous substance. No disease elsewhere.
A. V.	Omentum of Guinea-pig 2243.	1211	1,120	950	January 21, 1907	Died 66 days.	Intraperitoneal	Omentum thickened, retracted, and beset with caseous foci. Scattered caseating tubercles on the peritoneum and diaphragm. A moderate number of caseous tubercles in the spleen and kidneys. Lungs grey and solid, and beset with caseous foci. Ventral mediastinal glands caseated.
A. V.	Omentum of Guinea-pig 2406.	1362	1,350	1,040	June 5, 1907	Died 127 days.	Intraperitoneal	In the omentum there were a few grey tubercles with opaque centres. In the margins of the lungs there were a few small caseating nodules and scattered tubercles in the lung substance. The cortex of the right kidney showed a single projecting diffusely caseous nodule extending as a caseous streak through the pyramids. Caseous foci in a mediastinal gland. Numerous joints swollen and filled with caseo-pus.
A. V.	Omentum of Guinea-pig 2407.	1360	1,500	2,470	June 5, 1907	Killed 141 days.	Intrapulmonary	Each lung showed three caseating tubercles up to a millet seed. In the left kidney there was a caseating nodule the size of a hemp seed. No disease elsewhere.
A. V.	Original material (Liver of a pheasant).	818	1,800	1,500	April 7, 1908	Killed 109 days.	Subcutaneous	Ulcer with caseous margins. Inguinal glands caseous and softened. Spleen showed two yellow tubercles. A few miliary tubercles in the liver. Cortices of kidneys pitted; caseous streaks extending through the pyramids. In the lungs there was one caseating nodule and five miliary tubercles. Caseous nodules in the axillary, iliac, mediastinal, and sternal glands.
A. X.	Mediastinal gland of Calf 566.	1598	1,620	1,190	December 13, 1907.	Died 24 days.	Intravenous	Spleen swollen and speckled with greyish white foci. Lungs showed a little marginal emphysema. Liver, kidneys, and lymphatic glands normal. Numerous T.B. in the liver and spleen, none in the lung and kidney.
A. X.	Liver of Calf 566	1599	1,820	1,600	December 13, 1907.	Killed 160 days.	Intraperitoneal, partly subcutaneous.	Caseous nodules in the subcutaneous tissue and omentum and on the peritoneum. Axillary and ventral mediastinal glands caseous. Scattered caseous nodules up to a wheat grain in the lungs. A caseous tubercle in one kidney. Right elbow and left knee joints swollen and filled with caseous substance.
A. X.	Liver of Calf 566	1597	2,350	3,120	December 13, 1907.	Killed 343 days.	Subcutaneous	In the subcutaneous tissue of the back there was a small collection of caseous nodules embedded in the fat. The scapular gland the size of a sparrow's egg was composed throughout of soft caseous substance. No tuberculosis elsewhere.
A. X.	Original material (Lung of a fowl through a rabbit).	1215	1,450	1,000	January 29, 1907.	Died 141 days.	Subcutaneous	Caseous tumour and small ulcer in the skin. Inguinal glands caseous. Spleen showed several caseous miliary tubercles. Numerous caseous gritty tubercles in the kidneys. Numerous caseous tubercles in the lungs and gritty nodules replacing the margins. Grey points in the liver. Mediastinal and mesenteric glands caseous. Ileum and blind end of caecum caseous and gritty. Left elbow and both knee joints enlarged and filled with caseous substance.

P. II.	Sternal gland of Cat 62.	578	3,730	3,000	December 7, 1905.	Died 19 days.	Intravenous	Acute tuberculosis. (Spleen 14 by 2·5 by 1·3 cm.)
P. II.	Mesenteric Gland of Pig 110.	667	1,140	1,550	January 18, 1906.	Killed 106 days.	Subcutaneous	Tumour filled with thick yellow gritty caseo-pus. Yellow gritty tubercles in the inguinal and iliac glands. Three caseating tubercles in the lungs. No disease elsewhere.
P. XXI.	Original material (Submaxillary gland of a pig).	562	1,950	2,220	December 5, 1905.	Killed 41 days.	Intraperitoneal	A few transparent tubercles with opaque centres in the omentum. (No T.B.) Animal otherwise healthy.
P. XXI.	Lung of Rabbit 1433.	1596	1,880	2,480	December 11, 1907.	Killed 155 days.	Intraperitoneal	Animal fat. A few transparent tubercles in the omentum (T.B.). In the dilated ileum and the terminal portion of the caecum there were collections of soft yellowish substance both of which contained moderately numerous tubercle bacilli. No tuberculosis elsewhere.
P. XXI.	Sternal gland of Rabbit 1165.	1189	2,000	2,700	January 11. 1907.	Killed 94 days.	Intrapulmonary	P.M. showed two grey submiliary tubercles with opaque centres in the omentum and one on the diaphragm. No disease elsewhere.
P. XXI.	Organs of Guinea-pig 2411.	1329	1,500	1,250	May 8, 1907	Died 115 days.	Intrapulmonary	The right lung was adherent to chest and pericardium; the anterior lobe and a third of the posterior was cystic and filled with soft caseous substance and calcareous granules and the rest of the lung contained discrete caseo-calcareous nodules. The left lung was similar. In the kidneys there were discrete caseating nodules up to a hemp seed and soft caseous streaks in the pyramids. Many of the limb joints were swollen and filled with caseo-pus. Spleen normal.
P. XXI.	Lung of Rabbit 1329.	1433	1,590	1,100	August 31, 1907.	Died 102 days.	Intrapulmonary	The right lung was adherent and on the parietal pleura and pericardium there were flattened grey caseating growths; the lung substance contained scattered caseating tubercles and patches in the margins. A few grey foci in the kidneys. Numerous limb joints were swollen and filled with soft caseous substance. Caseous nodules on the peritoneum and in the axillary regions. Opaque foci in the axillary glands.

INOCULATION EXPERIMENTS ON MICE WITH AVIAN TUBERCLE BACILLI.

INTRAPERITONEAL INOCULATIONS.

Virus.	Source of Culture.	Number of Mouse.	Age and Generation of Subculture Inoculated.	Dose.	Date of Inoculation.	Duration of Life.	Result.
A IV.	Prescapular gland of Calf 494.	98	21 days, 4th generation.	0·2 mg.	November 8, 1907	Died 180 days.	Omentum, spleen, and liver normal. Congested patches in the kidneys. Lungs showed grey translucent foci. A few T.B. in the spleen, liver, and kidneys, and a moderate number in the lungs.
”	”	97	”	1·0 mg.	”	Died 26 days.	Omentum slightly thickened by soft grey tissue. Spleen large, measuring 2·5 by 0·9 cm., substance firm. Anterior lobes of lungs reddish grey and two caseous miliary nodules in the caudal lobes. Liver normal. Soft grey nodule in left kidney. Very numerous tubercle bacilli in the spleen and liver substance; numerous T.B. in kidney and lung nodules.
”	”	96	”	2·0 mg.	”	Died 86 days.	Omentum slightly thickened. Spleen mottled with reddish grey patches. Liver pale. Lungs closely beset with grey nodules. Kidneys pale. Grey foci in the mucous membrane of small intestine. Smears showed very numerous T.B. in the spleen, liver, lung, and small intestine.

INOCULATION EXPERIMENTS ON MICE WITH AVIAN TUBERCLE BACILLI—*continued.*

INTRAPERITONEAL INOCULATIONS—*continued.*

Virus.	Source of Culture.	Number of Mouse.	Age and Generation of Subculture Inoculated.	Dose.	Date of Inoculation.	Duration of Life.	Result.
A. IV.	Prescapular gland of Calf 494.	95	21 days. 4th generation.	4·0 mg.	November 8, 1907	Died 31 days.	Omentum contained three tubercles. Spleen enlarged, firm, and speckled with grey points. Liver showed greyish white nodules up to 2 mm. In the left kidney there were fifteen purulent miliary nodules. The lungs contained three grey nodules up to 4 mm. slightly opaque in the centre. Smears showed very numerous T.B. in the liver and spleen, and numerous T.B. in the lung and inguinal gland. There were also blue-staining organisms in the lung and kidney nodules.
,,	,,	94	,,	10·0 mg.	,,	Died 279 days.	Omentum a little thickened. Peritoneum normal. Spleen slightly swollen. Lungs dark and congested. Liver and kidneys normal. Very numerous T.B. in the principal organs, resembling pure culture in the lung and liver.
,,	,,	92	,,	20·0 mg.	,,	Died 348 days.	Omentum slightly thickened and retracted. Spleen a little swollen. Liver pale, tissue translucent in appearance; a few flat grey nodules with caseous centres on the surface. Kidneys pale, surfaces pitted. Lungs were reddish-grey and airless: pleural cavities filled with blood clot. Smears showed very numerous T.B in the principal organs and almost like culture in the lumbar gland.
,,	,,	93	,,	40·0 mg.	,,	Died 53 days.	Small ulcer in the skin: inguinal gland enlarged and purulent. Several soft caseous nodules up to a pea in size on the omentum and peritoneum. Spleen a little enlarged. Liver and kidneys normal. A single grey nodule in the right lung. Numerous T.B. in the liver, spleen, and lung nodule, a few T.B. in the kidney.
A. X.	Original material	99	21 days, 7th generation.	0·01 mg.	November 27, 1907	Killed 350 days.	In the omentum there was a pea-sized nodule filled with soft caseous substance. Animal otherwise healthy. There were seen in smears, numerous T.B. in omental nodule and mesenteric gland; no T.B. in liver, lung, spleen, and kidney.
,,	,,	100	,,	0·1 mg.	,,	Died 191 days.	The lungs were congested and the spleen was a little enlarged. Tissues otherwise normal. Smears showed very numerous T B. in the spleen, numerous T.B. in the lung, moderately numerous T.B. in liver and kidney.
,,	,,	101	,,	1·0 mg.	,,	Died 43 days.	Omentum slightly thickened. Lungs congested. Spleen a little enlarged. Liver, kidneys, and lymphatic glands normal. Smears showed very large numbers of T.B. in the liver, lungs, and spleen, and a few in the kidney.
,,	,,	103	,,	10·0 mg.	,,	Died 260 days.	On the mesentery and peritoneum there were a few grey nodules with caseous centres. Spleen enlarged showed a greyish mottling. Kidneys pale. Other organs had been eaten. Smear showed swarms of T.B. in the spleen and very numerous in the kidney.

SUBCUTANEOUS INOCULATIONS.

Virus.	Source of Culture.	Number of Mouse.	Age and Generation of Subculture Inoculated.	Dose.	Date of Inoculation.	Duration of Life.	Result.
A. IV.	Prescapular gland of Calf 494.	83	21 days, 4th generation.	0·2 mg.	November 8, 1907	Died 155 days.	Minute ulcer in the skin and a soft caseous nodule in the subcutaneous tissue of the back. Spleen 2·3 by 0·6 cm. was enlarged and firm; Malpighian bodies were prominent and many showed minute central opacities. Lungs contained numerous semi-translucent grey nodules up to 4 mm. in diameter, with more opaque, softer, greyish white centres. The interlobular network of the liver was well marked. Kidneys pale. Scapular and inguinal glands were enlarged, firm, and translucent.

							Smear preparation from the liver showed numerous tubercle bacilli ; from the scapular gland very numerous.
,,	,,	84	,,	1·0 mg.	,,	Died 200 days.	Small caseous tumour in the back, and a deep ulcer 5 mm in diameter. Axillary glands enlarged and firm. Liver packed with grey foci. Lungs filled the pleural cavities ; they were almost replaced by confluent yellowish grey nodules. Kidneys normal. Spleen had been eaten.
	,,	85	,,	2·0 mg.	,,	Killed 243 days.	Animal was in good condition. There was a minute ulcer in the back at the seat of inoculation, and two more ulcers nearer the tail surrounded by cicatricial tissue. Organs appeared normal. Smears showed moderately numerous T.B. in the lung, spleen, and ulcer ; no T.B. in the liver and kidney.
,,	,,	86	,,	4·0 mg.	,,	Killed 333 days.	Several scars and small ulcers in the back at seat of inoculation. Scapular glands a little enlarged. A few points in the lungs, other organs normal. Smears showed fairly numerous tubercle bacilli in the scapular gland spleen, and lung ; none in the liver. Culture from spleen.
,,	,,	87	,,	10·0 mg.	,,	Died 277 days.	At the seat of inoculation there was a hempseed-sized nodule of soft yellow substance. Neighbouring glands enlarged. Lungs congested showed minute grey foci. Other organs normal. Smears from the inguinal gland and spleen showed numerous T.B. A few in the liver.
,,	,,	88	,,	20·0 mg.	,,	Died 143 days.	Minute healing ulcer in the skin of back. Axillary glands enlarged. Spleen enlarged, 3·2 by 0·8 cm., showed grey points beneath the capsule. Grey foci in the liver. Lungs almost replaced by firm, grey, semi-translucent tissue. Kidneys normal.
,,	,,	89	,,	20·0 mg.	,,	Died 81 days.	Flattened caseous patches in subcutaneous tissue of back. Lungs congested and oedematous. Liver oedematous. Spleen and kidneys normal. A moderate number of tubercle bacilli in the lungs and spleen, a few in the liver, none in the kidney.
,,	,,	90	,,	40·0 mg.	,,	Died 280 days.	Soft caseous nodule at the seat of inoculation in the subcutaneous tissue. In the right lung there was a grey nodule 1·5 mm. in diameter with an opaque centre. Other organs and glands normal. Smears showed very numerous T.B. in axillary gland and moderately numerous in spleen, liver, and lung.
A. X.	Original material	102	21 days, 7th generation.	1·0 mg.	November 27, 1907	Killed 350 days.	Small depressed ulcer at the seat of inoculation. Inguinal gland enlarged. Iliac normal. In the caudal lobe of the left lung there was a single grey miliary nodule. Animal otherwise healthy. A few T.B. in the inguinal and iliac glands ; one in the lung nodule ; none in the spleen or liver.
,,	,,	104	,,	10·0 mg.	,,	Killed 127 days.	Grey nodule in subcutaneous tissue of thigh. Spleen greatly enlarged, firm, and speckled with grey foci. Numerous grey points in the liver. Lungs were congested and beset with grey nodules. No caseation of lymphatic glands.
,,	,,	105	,,	50·0 mg.	,,	Died 105 days.	Clean dry ulcer in skin of abdomen. Inguinal and iliac glands enlarged. Spleen enlarged and peppered with grey points. Lungs sank in water ; they consisted almost entirely of firm greyish-white tissue. Liver and kidneys normal. Very numerous tubercle bacilli in the lung and spleen.
,,	,,	106	,,	50·0 mg.	,,	Died 128 days.	Ulcer in the back with caseous tissue under the margins. Spleen enlarged, firm, and red. Liver speckled with grey points. Lungs solid and composed of greyish white tissue. Scapular glands enlarged.

FEEDING EXPERIMENTS ON MICE WITH AVIAN TUBERCLE BACILLI.

Virus.	Material Used.	Number of Mouse.	Date of Feeding.	Duration of Life.	Result.	Microscopical Examinations.					
						Intestine.	Mesenteric Gland.	Lung.	Spleen.	Liver.	Kidney.
A. X.	Liver of Calf 560.	71	September 23, 1907.	Killed 29 days.	Animal appeared healthy.	No. T.B.	No T.B.	No T.B.	No T.B.	No T.B.	No T.B.
„	„	72	„	Killed 57 days.	Peyer's patches a little prominent. Animal otherwise normal.	Moderately numerous T.B.	Few T.B.	No smear	No. T.B.	No T.B.	No smear
„	„	73	„	Killed 78 days.	Peyer's patches were firm and showed whitish foci. Whitish streaks in the mesenteric glands. Animal otherwise normal.	Very numerous T.B.	Numerous T.B.	Few T.B.	Few T.B.	No T.B.	No T.B.
„	Liver of Calf 558.	79	October 31, 1907.	Killed 106 days.	A few opaque points in the Peyer's patches. Two whitish foci in the mesenteric glands. In each lung there were six translucent foci. No disease elsewhere.	Very numerous T.B.	Moderately numerous T.B.	Numerous T.B.	Few T.B.	No T.B.	No T.B.
„	„	80	„	Killed 120 days.	Peyer's patches enlarged and beset with opaque foci. Animal otherwise normal.	Very numerous T.B.	Numerous T.B.	Few T.B.	No T.B.	No T.B.	No T.B.
„	„	81	„	Killed 144 days.	Peyer's patches showed irregular whitish foci. Mesenteric glands were enlarged and contained caseous patches. Spleen enlarged and firm. Two grey foci in the lungs. Liver and kidneys normal.	Very numerous T.B.	No smear	Few T.B.	Moderately numerous T.B.	Moderately numerous T.B.	Few T.B.
„	Liver of Calf 560.	75	September 23, 1907.	Died 223 days.	The intestinal mucous membrane was speckled with whitish foci. Peyer's patches were enlarged and showed opaque foci. Spleen was enlarged, firm, and beset with soft grey nodules. Liver showed numerous grey points and greyish white tubercles up to a rape seed. The lungs were closely filled with grey nodules up to 4 mm. in diameter. The scraping from the intestine resembled pure culture.	T.B. swarming.	No smear	No smear	No smear	No smear	No smear
„	Liver of Calf 560.	76	September 23, 1907.	Killed 379 days.	The Peyer's patches were a little prominent but showed no opacities. Mesenteric glands normal. Beneath the pleura of the right lung there was a small grey translucent patch. Liver, spleen, and kidneys normal. Cultures grew from the spleen and liver.	No T.B.	Moderately numerous T.B.	Moderately numerous T.B.	Few T.B.	No T.B.	No smear.
„	Liver of Calf 558.	82	October 31, 1907.	Died 400 days.	The animal was normal except for slight swelling of the most posterior mesenteric gland in which there were no opacities.	Few T.B.	Numerous T.B.	No T.B.	Few T.B.	No T.B.	No T.B.

FEEDING EXPERIMENTS ON MICE WITH CULTURES OF MAMMALIAN TUBERCLE BACILLI.

Virus.	Source of Culture.	Number.	Date of Feeding.	Duration of Life.	Result.	Microscopical Examintions.					
						Intestines.	Mesenteric Gland.	Lung.	Spleen.	Liver.	Kidney.
B. XI.	Original material.	107	February 14, 1908.	Died 124 days.	Spleen swollen. Lungs congested; right anterior lobe solid and greyish-white. Other organs and glands normal.	No smear	No smear	Very numerous T.B.	Few T.B.	No T.B.	No smear
"	"	108	"	Killed 139 days.	A single translucent nodule in the lung. No disease elsewhere.	Few T.B.	No T.B.	No T.B.	No T.B.	No T.B.	No T.B.
"	"	109	"	Killed 159 days.	The lungs contained discrete greyish-white nodules up to 2 mm. in diameter. Intestines, mesenteric glands, &c., normal.	Moderately numerous T.B.	Few T.B.	Numerous T.B.	1 T.B.	No T.B.	2 T.B.
"	"	110	"	Died 179 days.	Lungs congested; spleen enlarged. Animal otherwise appeared normal.	Numerous T.B.	Moderately numerous T.B.	Moderately numerous T.B.	Few T.B.	2 T.B.	No smear
"	"	112	"	Died 183 days.	Lungs were congested and contained two nodules with grey capsules filled with soft caseous substance. No disease elsewhere.	Few T.B.	Numerous T.B.	Very numerous T.B.	Few T.B.	No T.B.	No T.B.
E. II.	"	116	"	Died 78 days.	In the lungs there were scattered translucent foci. No sign of disease elsewhere.	No smear	Few T.B.	Moderately numerous T.B.	1 T.B.	No T.B.	No T.B.
"	"	114	"	Died 86 days.	Animal appeared normal.	No smear	Few T.B.	3 T.B.	No T.B.	No T.B.	No T.B.
"	"	113	"	Killed 139 days.	A single grey miliary nodule in the lung. Yellow purulent nodule in the liver. No disease elsewhere.	Few T.B.	Few T.B.	Few T.B.	No T.B.	No T.B.	No T.B.
"	"	115	"	Killed 235 days.	In the lungs there were several yellowish-grey firm areas in the pinkish lung tissue. No other disease.	Moderately numerous T.B.	Moderately numerous T.B.	Moderately numerous T.B.	No T.B.	No T.B.	No smear
"	"	117	"	Died 254 days.	Greyish solid patch at the caudal extremity of the right lung. Other organs and glands normal.	Moderately numerous T.B.	Few T.B.	Numerous T.B.	No T.B.	No T.B.	No T.B.
"	"	118	"	Died 254 days.	Each lung contained several firm grey solid patches.	No T.B.	Few T.B.	Numerous T.B.	No T.B.	No T.B.	No T.B.

FEEDING EXPERIMENTS ON MICE WITH EMULSION OF TUBERCULOUS MATERIAL CONTAINING BOVINE TUBERCLE BACILLI.

Virus.	Material used.	Number.	Date of Feeding.	Duration of Life.	Result.	Microscopical Examination.					
						Intestines.	Mesenteric Gland.	Lung.	Spleen.	Liver.	Kidney.
B. VIII.	Organs of tuberculous rabbits.	123	February 25, 1908. February 27, 1908. March 1, 1908	Died, 24 days.	Organs and glands appeared normal.	No T.B.	Few T.B.	No T.B.	No T.B.	No T.B.	No T.B.
,,	,,	125	,,	Killed, 121 days.	Peyer's patches a little prominent. No sign of tuberculosis.	Few T.B.	Few T.B.	No T.B.	No T.B.	No T.B.	No T.B.
,,	,,	126	,,	Killed, 128 days.	Animal appeared normal.	No T.B.	Few T.B.	No T.B.	No T.B.	No T.B.	No T.B.
,,	,,	120	,,	Died, 162 days.	The lungs were a little congested, and in one there was a grey nodule about the size of a hemp-seed. No disease elsewhere.	2 T.B.	Few T.B.	Numerous T.B.	No T.B.	No T.B.	No T.B.
,,	,,	129	,,	Died, 188 days.	The lungs were congested and oedematous; they showed lighter grey areas scattered about the dark congested tissue. There was no disease elsewhere.	Moderately numerous T.B.	Few T.B.	Numerous T.B.	3 T.B.	1 T.B.	No T.B.

TABULAR SUMMARY OF INOCULATION EXPERIMENTS ON CALVES WITH CULTURES OF AVIAN TUBERCLE BACILLI.

(*a*) Subcutaneous.

Virus.	Source of Culture.	Number of Calf.	Weight at Inoculation in Kilos.	Date of Inoculation.	Dose.	Generation and Age of Subculture Inoculated.	Total Period under Cultivation.	Duration of Life.	Result.
A. I.	Original material.	402	28·12	April 26, 1906	100·0 mg.	4th generation, 21 days old.	70 days	Killed when well. 92 days.	Small tumour at seat of inoculation composed of softening caseous areas in a fibrous network. The prescapular gland was largely composed of caseous material set in brownish translucent tissue beset with calcareous foci. A left prepectoral and a left cervical gland were similar. There was no tuberculosis elsewhere.

A. II.	Original material.	432	28·57	May 22, 1906	50·0 mg.	4th generation, 21 days old.	69 days	Killed when well. 101 days.	There was a small tumour at the seat of inoculation. About half the prescapular gland was composed of translucent necrotic tissue with gritty foci. In the lung there were six grey tubercles each with a calcareous centre (smear, no T.B.). The thoracic glands contained scattered gritty tubercles. There were a few gritty foci in the portal glands. One suprarenal body contained a caseo-calcareous tubercle (smear, T.B. numerous). In the small intestine eleven small soft yellow tubercles were counted (smear, 4 T.B. seen). Some of the mesenteric glands contained small yellow foci and one a small necrotic patch (smear, no T.B.).
A. III.	Original material.	520	212·27	February 6, 1907.	100·0 mg.	4th generation, 22 days old.	315 days	Killed when well. 122 days.	Fibrous-walled cyst at seat of inoculation filled with mucoid caseo-purulent substance. The left prescapular gland contained a cyst of similar character, a small caseous nodule, and scattered opaque foci. In the thoracic and mesenteric glands were sparsely scattered soft caseous foci. In the liver was a single minute grey tubercle (smear, 1 T.B. seen).
A. IV.	Original material.	456	59·86	July 4, 1906	50·0 mg.	4th generation, 22 days old.	89 days	Killed when well. 108 days.	The tumour at the seat of inoculation was composed of translucent tissue with a caseo-calcareous network. The left prescapular gland contained four caseo-calcareous nodules. There was no tuberculosis elsewhere.
	,,	494	—	January 29, 1907.	50·0 mg. 1·0 mg.	7th generation, 21 days old.	322 days	Killed when well. 154 days.	There was a fibrous-walled cyst filled with muco-purulent material at the seat of inoculation on either side of the neck. The left prescapular gland contained two large caseo-necrotic gritty masses, the right three soft caseous gritty nodules. In the liver was a single tubercle (smear, T.B. numerous). There was no tuberculosis elsewhere.
	Calf 494 (prescapular gland).	568	85·26	November 9, 1907.	100·0 mg.	4th generation, 21 days old.	130 days	Killed when well. 181 days.	At the seat of inoculation there was a cyst containing caseo-pus. The left prescapular gland contained two caseo-calcareous nodules. In the lung there was one soft grey translucent nodule (smear, no T.B.). There was no tuberculosis elsewhere.
A. V.	Original material.	458	51·69	July 4, 1906	50·0 mg.	4th generation, 22 days old.	88 days	Killed when well. 103 days.	The tumour at the seat of inoculation consisted of translucent tissue containing caseous nodules and caseo-calcareous granules. The left prescapular gland contained two small caseo-calcareous nodules. There was no tuberculosis elsewhere.
P. II.	Original material.	424	26·75	May 22, 1906	50·0 mg.	24th generation, 21 days old.	439 days	Killed when well. 100 days.	At the seat of inoculation there was a fibrous-walled cyst containing caseous masses and purulent fluid. The left prescapular gland was a cyst containing caseo-necrotic masses and caseo-pus. In the small intestine there were four nodules containing creamy purulent substance (smear, 2 T.B. seen). There was no tuberculosis elsewhere.
P. III.	Original material.	282*	37·64	June 17, 1905	10·0 mg.	5th generation, 21 days old.	100 days	Killed when well. 17 days.	There was a hard fibroid tumour containing necrotic streaks, surrounding the jugular vein at the seat of inoculation. The adjacent cervical glands were partly composed of translucent tissue penetrated with a yellow network; other glands in the neighbourhood were less severely affected. No definite tuberculous lesions were seen elsewhere. A few T.B. were seen in a smear from the spleen, none in smears from the kidney, liver or lung.

* Inoculated in the sheath of the jugular vein.

† A culture made from the prescapular gland was mammalian.

TABULAR SUMMARY OF INOCULATION EXPERIMENTS ON CALVES WITH CULTURES OF AVIAN TUBERCLE BACILLI—*continued.*

(*a*) SUBCUTANEOUS—*continued.*

Virus.	Source of Culture.	Number of Calf.	Weight at Inoculation in Kilos.	Date of Inoculation.	Dose.	Generation and Age of Subculture Inoculated.	Total Period under Cultivation.	Duration of Life.	Result.
P. III.	Original material.	**318**	97·90	September 7, 1905.	**50·0** mg.	10th generation, 21 days old.	182 days	Killed when well. 95 days.	At the seat of inoculation there was a fibrous-walled cyst containing yellowish pus and a partially detached necrotic mass. The left prescapular gland was mainly composed of caseo-necrotic substance, in places softened. In the skin over the gland was a small ulcer, connected with the gland by a sinus. One yellow tubercle and a pea-sized greyish nodule were seen in the lungs. In the heart muscle there was a yellow gritty nodule (smear, 1 T.B. seen). Most of the lymphatic glands contained one or more small tubercles usually caseous and softened. In the Peyer's patches there were a few soft yellow tubercles, and several firm greyish-red nodules up to a pea in size (smear, no T.B.) of which the majority were ulcerated.
	Calf 318 (prescapular gland).	**530**	28·12	April 25, 1907	**500·0** mg.	7th generation, 142 days old.	500 days	Killed. 168 days	There were six nodules of creamy caseo-purulent substance at the seat of inoculation, the largest the size of a sparrow's egg. There was no tuberculosis elsewhere.
P. XXI.	Original material.	**412**	27·66	May 22, 1906	**50·0** mg.	8th generation, 21 days old.	169 days	Killed when well. 99 days.	Fibroid tumour, containing muco-pus in a central cavity, at seat of inoculation. The right prescapular gland was largely composed of caseo-necrotic substance, in which was a cavity containing serum and a central necrotic mass. In the lungs were three hard caseo-calcareous nodules. One tubercle was seen in the right tonsil, and four or five in each suprarenal; a few gritty foci were seen in the spleen and minute grey foci in the liver. Nearly every lymph gland in the body and many hameo-lymph glands contained scattered calcareous foci or a few small caseous or calcareous tubercles. T.B. were numerous in a tubercle from a suprarenal body, and three were seen in a focus from the spleen.
P. XXVII.	Original material.	**390***	63·50	February 22, 1906.	**50·0** mg.	4th generation, 21 days old.	73 days	Killed when well. 90 days.	Flattened fibroid local lesion, containing scattered soft caseous nodules. The left prescapular gland was composed of softening caseous material in a fibrous capsule. In the lungs there were a few small grey tubercles and a single caseous nodule the size of a bean. The thoracic and several abdominal lymphatic glands contained scattered calcareous or caseous tubercles. The liver contained a few grey tubercles with opaque centres; in the suprarenals there was a number of caseous gritty tubercles.
	„	**492**	98·35	January 7, 1907.	**200·0** mg.	8th generation, 67 days old.	392 days	Killed when well. 172 days.	Small local lesion composed of caseo-purulent gritty masses set in fibroid tissue. The adjacent glands were normal. There was no tuberculosis elsewhere.
P. XLIV.	Original material.	**490**	110·67	January 4, 1907.	**100·0** mg.	5th generation, 22 days old.	188 days	Killed when in moderately good health. 122 days.	Fibrous-walled cyst at seat of inoculation, filled with muco-purulent substance. In the adjacent prescapular gland there were three cysts containing similar material. Three mesenteric glands showed soft yellow nodules and foci (smear, a few T.B.). In the liver was a single soft yellowish focus (smear, no T.B.). The left suprarenal body showed three small greyish patches. The right one (smear, no T.B.) showed one similar patch.

(*b*) Intravenous.

A. VIII.	Original material.	**524**	31·75	May 28, 1907	**200·0** mg.	4th generation, 21 days old.	186 days	Died. 30 days	Almost the whole of each lung was dark reddish grey and airless. Early caseous patches and small grey nodules could be seen everywhere throughout the lungs; in some parts the caseation was extensive. The thoracic and many other lymphatic glands were congested and oedematous. The spleen, liver, and kidneys showed no definite signs of tuberculosis, but T.B. were numerous in scrapings from these organs and from the small intestine and the mesenteric and popliteal glands.
	"	**544**	35·38	"	**10·0** mg.	"	"	Died. 33 days	The greater portion of the lung substance was dark red, solid, and airless: the right anterior lobe was closely beset with early caseous patches. The thoracic glands were congested and oedematous. The portal glands showed some small yellow patches. No definite signs of tuberculosis were seen elsewhere. T.B. were numerous in the liver, spleen, and lung, and scanty in a scraping from the intestine.
A. X.	Original material.	**546**	55·79	May 30, 1907	**50·0** mg.	4th generation, 21 days old.	191 days	Died. 32 days	In the anterior halves of the lungs there were large red areas of consolidation. The rest of the lung tissue was moderately congested and oedematous. The spleen was greatly enlarged, dark red, and contained two greyish yellow nodules. The thoracic and many other glands were congested and oedematous. T.B. were numerous in scrapings from the lung, liver, spleen, and mediastinal gland, and scanty in one from the intestine.
	"	**548**	53·06	"	**100·0** mg.	"	"	Killed when dying. 40 days.	The lungs were not severely affected; scattered throughout were dark red and greyish-red pneumonic areas; the former sank in water. There were no visible tubercles. The spleen and liver were not quite normal in appearance but showed no definite tubercles. In the kidneys indefinite grey foci were just visible. Numerous T.B. were seen in scrapings from all the organs and from the mesenteric gland and intestine.

* Cultures made from the lung and bronchial gland were mammalian.

TABULAR SUMMARY OF INOCULATION EXPERIMENTS ON PIGS WITH CULTURES OF AVIAN TUBERCLE BACILLI.

(*a*) Subcutaneous.

Virus.	Source of Culture.	Number of Pig.	Weight at Inoculation in Kilos.	Date of Inoculation.	Dose.	Generation and Age of Subculture Inoculated.	Total Period under Cultivation.	Duration of Life.	Result.
A. VII.	Original material.	**180**	7·25	March 12, 1907.	**50·0** mg.	4th generation, 21 days old.	112 days	Killed when well. 105 days.	Small cyst containing pus at seat of inoculation. A left inguinal gland contained softening caseous nodules. The left sternal gland contained caseous gritty nodules. One or two minute foci were seen in the lungs and kidneys. In some of the mesenteric glands were caseous streaks and foci; others were diffusely caseous throughout. In the tonsils were nodules of secretion containing T.B. T.B. were also found in the lung, spleen, liver, and kidneys; they were very numerous in smears from the intestines and the tuberculous glands.

TABULAR SUMMARY OF INOCULATION EXPERIMENTS ON PIGS WITH CULTURES OF AVIAN TUBERCLE BACILLI—*continued.*

(*a*) SUBCUTANEOUS—*continued.*

Virus.	Source of Culture.	Number of Pig.	Weight at Inoculation in Kilos.	Date of Inoculation.	Dose.	Generation and Age of Subculture Inoculated.	Total Period under Cultivation.	Duration of Life.	Result.
A. X.	Original material.	**264**	31·75	May 21, 1908	50·0 mg.	11th generation, 12 days old.	478 days	Killed when well. 105 days.	Small cyst containing soft caseous substance at the seat of inoculation. Caseous nodule in an inguinal gland on the left side and a few gritty tubercles in one on the right. No tuberculosis elsewhere. No T.B. in smear preparations from the organs.
P. II.	Original material.	**106**	14·51	June 14, 1905.	5·0 mg.	5th generation, 21 days old.	97 days	Killed when well. 215 days.	At the seat of inoculation in the abdominal wall was a small healed ulcer. The adjacent inguinal glands each contained a small cavity filled with soft cheesy material. One portal gland contained a single tubercle (smear, 4 T.B. seen).
	Pig 110 (mesenteric gland).	**136**	18·14	March 24, 1906.	100·0 mg.	3rd generation, 24 days old.	65 days	Killed when well. 142 days.	At the seat of inoculation there was a mass of softened caseous substance in a thin fibrous capsule. The adjacent inguinal glands contained small caseous nodules. In the liver was a single grey nodule (smear, no T.B.). One sternal gland contained some minute yellow calcareous foci.
P. XXVII.	Original material.	**140**	11·34	April 12, 1906.	50·0 mg.	6th generation, 15 days old.	122 days	Killed when well. 130 days.	Fibrous-walled cyst at seat of inoculation containing caseo-purulent substance Two enlarged right inguinal glands contained softening caseous nodules and foci. Four enlarged right iliac glands contained caseous and caseo-calcareous tubercles; there were similar tubercles in the mesenteric and colic glands; in the former they were numerous and in places confluent. In the liver there were sparsely scattered soft yellow tubercles (smear, a few T.B.).

(*b*) Intraperitoneal.

Virus.	Source of Culture.	Number of Pig.	Weight at Inoculation in Kilos.	Date of Inoculation.	Dose.	Generation and Age of Subculture Inoculated.	Total Period under Cultivation.	Duration of Life.	Result.
A. VII.	Original material.	**182**	10·90	March 12, 1907.	10·0 mg.	4th generation, 21 days old.	112 days	Killed when well. 106 days.	On the peritoneum and the omentum were a few small tubercles and tuberculous patches. The mesenteric glands were enlarged; the majority contained caseous nodules or small yellow foci. In the kidneys and spleen grey translucent foci were seen. In the lungs were a very few similar foci and a single miliary tubercle. The ventral mediastinal glands showed a few calcareous grains. T.B. were numerous in the spleen, liver, small and large intestines, and in all the lymphatic glands examined; none was seen in a smear from the kidney.

P. II.	Original material.	**104**	9·98	May 4, 1905	10·0 mg.	3rd generation, 33 days old.	56 days	Killed when well. 69 days.	In the abdominal wall was a small caseous nodule (subcutaneous) and a few small yellow tubercles (subperitoneal). On the peritoneum and the omentum were moderately numerous caseous nodules (smear, T.B. numerous). The kidneys showed a few grey foci on the surface; on the surface of the liver too were a few yellow tubercles. In the lungs were three small greyish nodules. The coeliac glands were largely composed of brittle caseated tissue; many other abdominal and one or two thoracic glands contained yellowish streaks, foci, or discrete tubercles. One lumbar gland was large, caseous, and softened. There was a patch of necrosis round one of the veins of the left ear (intravenous inoculation attempted), and a gland adjacent to the ear contained two yellow foci (smear, T.B. moderately numerous).

(*c*) Intravenous.

A. VIII.	Original material.	**248**	46·25	April 7, 1908.	50·0 mg.	8th generation, 22 days old.	501 days	Died. 47 days	The lungs filled the chest. The extremities of the anterior lobes were reddish-grey and solid. The rest of the lungs was oedematous. The bronchial glands were firm, one showed an opaque focus. The spleen was enlarged, firm, and dark red. The portal glands were firm and showed necrotic streaks. There were patches of congestion in the intestines. T.B. were numerous in smears from the lung, liver, spleen, a Peyer's patch and a mesenteric gland, scanty in smear from the kidney.
A. X.	Original material.	**260**	29·48	May 21, 1908.	50·0 mg.	11th generation, 12 days old.	478 days	Died. 51 days	The lungs were firm and oedematous and showed a few scattered reddish-grey patches. The spleen was slightly swollen. The lymphatic glands showed occasional small indefinite yellowish grey patches. T.B. were very numerous in smears from the lung, spleen, liver, and a mesenteric gland, numerous in smears from the intestine and precrural gland.
	,,	**262**	30·38	,,	10·0 mg.	,,	,,	Died. 70 days	Lungs voluminous. The anterior inferior portions were reddish-grey and solid. Patchy congestion and oedema of the rest of the lungs. Bronchial glands congested. Yellow necrotic nodule in a portal gland. Tubercle bacilli were very numerous in smear preparations made from the principal organs.

TABULAR SUMMARY OF INOCULATION EXPERIMENTS ON GOATS WITH CULTURES OF AVIAN TUBERCLE BACILLI.

(*a*) Subcutaneous.

Virus.	Source of Culture.	Number of Goat.	Weight at Inoculation in Kilos.	Date of Inoculation.	Dose.	Generation and Age of Subculture Inoculated.	Total Period under Cultivation.	Duration of Life.	Result.
A. III.	Original material.	40	—	Feb. 6, 1907	100·0 mg.	4th generation, 22 days old.	315 days	Killed when well. 128 days.	The local tumour consisted of caseous softened nodules in a fibroid network. There were three ulcers in the overlying skin. Near the middle line of the neck there was another tumour, a small cyst containing caseo-pus. The left prescapular gland was caseo-necrotic throughout; the right contained a caseous nodule and opaque foci. Many other glands in the neck were affected. In the lungs was a number of caseo-purulent nodules, and there were some grey tubercles with caseo-calcareous centres. The thoracic glands contained scattered caseous gritty tubercles, or minute calcareous foci. In the stomach and intestines were a few scattered tubercles: one in a Peyer's patch was ulcerated. In the mesenteric and many other abdominal glands were numerous caseous gritty nodules. In the liver and kidneys were one or two small tubercles.
A. X.	Original material,	42	26·30	July 9, 1907	50·0 mg.	5th generation, 21 days old.	161 days	Killed when well. 98 days.	The local lesion was composed of caseo-necrotic gritty substance within a fibrous wall. The left prescapular gland contained caseo-necrotic gritty masses. On the omentum there was a nodule containing yellowish necrotic substance (smear, a few T.B.), and there were three small grey nodules on the peritoneum. The mesenteric and colic glands contained irregular calcareous granules in many places forming a network (smear, a few T.B.). In each kidney there was a single grey focus (smear, no T.B.). A testis showed several streaks of whitish gritty substance (smear, a few T.B.). No T.B. were seen in a scraping from the intestine.
	”	48	12·25	”	50·0 mg.	”	”	Killed when very ill. 83 days.	At the seat of inoculation there was a small ulcer. The left prescapular gland contained two caseo-necrotic slightly gritty masses; around the gland were several fibro-caseous tubercles. The lungs (oedematous and slightly congested) showed on the surface beneath the pleura numerous irregular translucent nodules with opaque centres, some gritty; they were seen in fewer numbers on section. The thoracic and portal glands contained a moderate number of small discrete caseous patches. In the omentum were two translucent tubercles (smear, a few T.B.). The liver was mottled on the surface with yellowish necrotic foci; these were less numerous on section. In the left kidney there were three minute foci. The Peyer's patches were closely beset with irregular pits with yellowish margins (smear, T.B. swarming). The mesenteric glands were enlarged and caseo-necrotic. In a scraping from the lung substance, T.B. were numerous, and in scrapings from the liver and spleen scattered T.B. were seen.

	Original material.	44	21·77	July 9, 1907	10·0 mg.	5th generation, 21 days old.	161 days	Killed when well. 154 days.	At the seat of inoculation there were small scattered caseo-calcareous tubercles. About half the left prescapular gland was occupied by caseo-necrotic masses. In the liver three miliary tubercles with gritty centres were seen (smear, no T.B.). The ileo-colic glands contained small caseous gritty patches. There were no tuberculous lesions elsewhere, but in a smear from a parasitic nodule in the lung a few T.B. were seen.
A. VII.	Original material.	54	—	Jan. 24, 1908	50·0 mg.	8th generation, 21 days old.	430 days	Killed when well. 119 days.	Fibrous-walled cyst with softening caseo-necrotic contents at seat of inoculation. The left prescapular gland contained softening caseo-necrotic nodules. A left cervical gland was caseo-necrotic throughout; two others contained caseo-calcareous nodules. In one mesenteric gland there were numerous softened caseous gritty collections (smear, a few T.B.). A left iliac gland contained four yellow tubercles (smear, no T.B.). No T.B. were seen in smears from the lung or liver.
P. II.	Original material.	36	40·36	Feb. 8, 1906	10·0 mg.	19th generation, 23 days old.	336 days	Killed when well. 131 days.	At the seat of inoculation there was a fibrous-walled cyst with softened pultaceous contents. The greater part of the prescapular gland was occupied by a softening caseous mass. In the lungs there was a fibrous nodule containing a pea-sized cavity filled with caseo-pus (smear, T.B.), and two smaller nodules of similar character: and also small scattered grey tubercles, some with calcareous centres (smears, no T.B.). The thoracic glands contained several caseous nodules, the largest 1 cm. in diameter. In one mesenteric gland there was a calcareous tubercle.

(*b*) Intravenous.

P. III.	Original material.	56	12·70	Jan. 29, 1908	10·0 mg.	27th generation, 21 days old.	1066 days	Died. 40 days	The lungs were congested, oedematous, and heavy, but floated in water. There were no visible tubercles. T.B. generally numerous were found in smears from the principal organs, the intestine, and a mesenteric gland.
,,	,,	58	22·22	,,	1·0 mg.	,,	..	Died. 35 days	The lungs were firm, heavy, and dark reddish-grey; the anterior parts, which were solid and sank in water, were filled with blood and oedema; there were no visible tubercles. T.B. were numerous in smears from lung, mediastinal gland, and liver, scanty in spleen; none was seen in smear from kidney

INOCULATION EXPERIMENT ON A CHIMPANZEE WITH CULTURE OF AVIAN TUBERCLE BACILLI.

Virus.	Source of Culture.	Number of Chimpanzee.	Weight at Inoculation in Kilos.	Date of Inoculation.	Dose.	Generation and Age of Subculture Inoculated.	Total Period under Cultivation.	Duration of Life.	Result.
A. II.	Original material.	20	6·43	May 22, 1906	50·0 mg.	4th generation, 21 days old.	69 days	Died 673 days	Four linear scars at the seat of inoculation. No sign of tuberculosis elsewhere.

TABULAR SUMMARY OF INOCULATION EXPERIMENTS ON RHESUS MONKEYS WITH CULTURES OF AVIAN TUBERCLE BACILLI.

(*a*) Subcutaneous.

Virus.	Source of Culture.	Number of Monkey.	Date of Inoculation.	Dose.	Generation and Age of Subculture Inoculated.	Total Period under Cultivation.	Duration of Life.	Result.
P. II.	Original material.	118*	Nov. 30, 1905	10·0 mg.	15th generation, 21 days old.	266 days	Killed when very ill. 97 days.	Severe general tuberculosis. (At the seat of inoculation there was a smooth walled cystic tumour containing caseous masses and caseo-pus. The axillary glands on each side contained only one small greyish tubercle apiece.)
	,,	120	,,	1·0 mg.	,,	,,	Killed when well. 113 days.	At the seat of inoculation was a thin patch of fibrous thickening. The adjacent glands were normal. The lungs showed two translucent grey tubercles, with opaque centres. There was no tuberculosis elsewhere.
P. III.	Original material.	134	April 12, 1906	10·0 mg.	18th generation, 15 days old.	399 days	Killed when well. 131 days.	At the seat of inoculation was a small white cicatrix. The adjacent axillary glands were normal. On the wall of the caecum were two small fibrous walled cysts filled with caseo-pus containing numerous tubercle bacilli. The wall of the caecum underlying the larger cyst was infiltrated with caseo-purulent collections and there was a minute ulcer on the mucous surface.
P. XXI.	Original material.	136	April 12, 1906	10·0 mg.	5th generation, 19 days old.	129 days	Killed when well. 138 days.	At the seat of inoculation was a small ulcer, communicating with a cavity in the subcutaneous tissues enclosed by a fibrous wall. The adjacent axillary glands were normal, and there was no tuberculosis elsewhere.
P. XXVII.	Original material.	138	April 12, 1906	10·0 mg.	6th generation, 15 days old.	122 days	Killed when well. 140 days.	At the seat of inoculation there was a small cicatrix. There was no tuberculosis anywhere.

(*b*) Intravenous.

A. I.	Original material.	158†	Nov 22, 1906	1·0 mg.	8th generation, 20 days old.	279 days	Died. 63 days	Death was evidently due to exposure to severe cold. At the seat of inoculation in the right arm were several small caseo-purulent nodules. The adjacent axillary glands were slightly enlarged, but otherwise normal. The lungs were normal. No T.B. were found in smears from the organs.
"	"	160	"	10·0 mg.	,	"	Died. 19 days	The monkey died after a very cold night. No definite tuberculous lesions were seen, but tubercle bacilli were found in the spleen, lung, liver, kidney, and mesenteric gland.
A. X.	Original material.	188	Nov. 27, 1907	50·0 mg.	7th generation, 21 days old.	302 days	Died. 18½ days	The lungs were congested and slightly oedematous: a few minute foci were seen in them. The spleen was swollen and the Malpighian bodies enlarged. The substance of the liver showed a fine grey network. T.B. were numerous in smears from lung, liver, spleen and bronchial gland; a few in the kidney.
"	"	198	"	100·0 mg.	,	"	Died. 28 days	The lungs were crepitant: a few patches of congestion were seen, but no foci. The spleen was swollen, the pulp firm: small necrotic areas and a faint grey tracing were seen on section. The liver was pale; numerous minute points could just be seen in the darker areas. All the lymphatic glands were enlarged and oedematous and showed grey points. Smears from the spleen, liver, and mesenteric gland showed a mass of T.B. T.B. were numerous in smears from the lung and kidney.
"	"	196	"	10·0 mg.	"	"	Died. 29 days	The lungs were a little firm, slightly oedematous (the right was slightly congested), and showed dark pigmentary mottling. The spleen was slightly enlarged, the Malpighian bodies prominent. The liver was pale: numerous grey points were seen on section through a hand lens. The kidneys were pale, the lymphatic glands enlarged and oedematous. T.B. were numerous in smears from the lung, spleen, liver, and mesenteric gland; scanty in kidney.
"	"	190‡	"	1·0 mg.	"	"	Died. 26 days	The lungs were oedematous, the left was congested. The bronchial glands were enlarged, oedematous, and showed opaque foci. The omentum and mesentery were thickened with greyish white tubercles. The spleen was large, soft, and packed with minute grey points. The abdominal glands were oedematous. T.B. were numerous in smears from spleen and bronchial gland, none seen in smear from lung, few in liver.
P. XXI.	Original material.	154	Nov. 22, 1906	1·0 mg.	11th generation, 22 days old.	383 days	Died. 34 days	The right lung was congested, and in it could be seen numerous grey foci. The left lung was paler, and only a few foci were seen in it. The spleen was enlarged and abnormal in appearance: no definite tubercles were seen in it. In the kidneys an occasional grey point could be detected. A few tubercle bacilli were seen in scrapings from the spleen, liver, and lung, none in the kidney or in several lymphatic glands which were examined.

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* Culture from lung mammalian in type. † Inoculation partly subcutaneous. ‡ Inoculation both intravenous and intraperitoneal.

TABULAR SUMMARY OF INOCULATION EXPERIMENTS ON PONIES WITH CULTURES OF AVIAN TUBERCLE BACILLI.

(*a*) Subcutaneous.

Virus.	Source of Culture.	Number of Pony.	Weight at Inoculation in Kilos.	Date of Inoculation.	Dose.	Generation and Age of Subculture Inoculated.	Total Period under Cultivation.	Duration of Life.	Result.
A. VII.	Original material.	10	103·40	Jan. 24, 1908	100·0 mg.	8th generation, 21 days old.	430 days	Died. 38 days	Acute septic peritonitis and pyaemia. There was a fibrous-walled cyst containing necrotic masses and serous fluid at the seat of inoculation. Of the left group of prescapular glands, one was about half replaced by necrotic substance, a second showed a small necrotic patch. A left cervical gland contained a few calcareous grains. There was no tuberculosis elsewhere.
A. VIII.	Original material.	2	334·68	Aug. 15, 1907	50·0 mg.	6th generation, 21 days old.	265 days	Killed when well. 158 days.	There was a small ulcer at the seat of inoculation. Two left prescapular glands contained each a large waxy caseous nodule. In the lungs there was a small grey patch beset with opaque foci (smear, one T.B. seen), a translucent nodule 1·2 cm. in diameter, and a smaller nodule slightly opaque in the centre. There was a fibro-calcareous nodule in the omentum. There was no tuberculosis elsewhere.

(*b*) Intravenous.

Virus.	Source of Culture.	Number of Pony.	Weight at Inoculation in Kilos.	Date of Inoculation.	Dose.	Generation and Age of Subculture Inoculated.	Total Period under Cultivation.	Duration of Life.	Result.
A. X.	Original material.	32	273·00	May 21, 1908	10·0 mg.	11th generation, 12 days old.	478 days	Died. 15 days	The lungs were heavy, congested, and oedematous, especially the anterior inferior portions. The spleen was swollen and dark red; the liver was pale; the peripheral lymphatic glands were dark and congested. T.B. were moderately numerous in the lung, scanty in smears from the liver, spleen, kidney, and prescapular and mesenteric glands.

TABULAR SUMMARY OF FEEDING EXPERIMENTS ON THE CALF, PIG, GOAT, MONKEY, AND HORSE WITH CULTURES OF AVIAN TUBERCLE BACILLI.

CALF.

Virus.	Source of Culture.	Number of Animal.	Weight when Fed, in Kilos.	Date of Feeding.	Dose.	Generation and Age of Subculture Inoculated.	Total Period under Cultivation.	Duration of Life.	Result.
P. II.	Original material.	5	41·72	July 16, 1907	About 1000·0 mg.	31st generation, 21 days old.	859 days	Killed. 205 days	In each of three rectal glands there were from one to three soft yellowish foci (culture avian). There was no tuberculosis elsewhere.

PIGS.

A. VII.	Original material.	178	9·27	March 12, 1907.	100·0 mg.	4th generation, 21 days old.	112 days	Killed.	101 days	Small collections of pus were found in each tonsil (smear, T.B.). In the mesenteric glands two small caseous gritty nodules were found, and many of the glands showed fine yellowish markings (smear, T.B. swarming): similar appearances were present in the portal and coeliac glands (T.B. numerous). No lesions were seen elsewhere in the body, but T.B. were numerous in smears from the lung, spleen, liver and bronchial gland, very numerous in a scraping from the intestine, scanty in a smear from the kidney.
,,	,,	176	9·97	,,	50·0 mg.	,,	,,	Killed.	315 days	In the largest submaxillary gland on each side there were two calcareous tubercles. The majority of the mesenteric glands contained irregular caseo calcareous nodules (smear, T.B. moderately numerous). Many of the colic glands contained calcareous granules. Two portal glands contained each a calcareous granule (smear, one T.B. seen). The left iliac gland contained six caseous and calcareous nodules. There was no tuberculosis elsewhere, and smears from the organs showed no T.B. Cultures sown from the lesions failed to grow.
A. X.	Original material.	196	14·06	July 9, 1907	50·0 mg.	5th generation, 21 days old.	161 days	Killed.	142 days	The glands of the neck and submaxillary regions were normal. The mesenteric glands were slightly enlarged: almost all contained caseous gritty nodules and masses which easily shelled out. Several of the small colic glands contained similar nodules. The intestines were normal. Smear preparations from the lung, spleen, liver, and kidney showed no T.B.: in a smear from a mesenteric gland T.B. were moderately numerous.
,,	,,	198	13·60	,,	50·0 mg.	,,	,,	Killed.	111 days	In one right submaxillary gland there was a soft caseous tubercle. The mesenteric glands were enlarged and practically replaced by soft caseous gritty masses which easily shelled out. The intestines were normal. In one bronchial gland there was a minute opaque focus. Smears from the organs and the intestinal mucous membrane showed no T.B.; a smear from a mesenteric gland showed a few scattered T.B.
,,	,,	200	16·78	,,	50·0 mg.	,,	,,	Killed.	126 days	The glands of the neck and submaxillary regions were normal. The mesenteric glands were not enlarged, but were closely beset with caseous gritty nodules which easily shelled out. The intestines were normal. In the lung a soft grey nodule and a few congested patches were seen. No T.B. were seen in smears from the organ and from a Peyer's patch; in a smear from a mesenteric gland T.B. were moderately numerous.
P. II.	Original material.	110	23·12	Aug. 12, 1905	Growth from seven serum tubes.	9th generation, 18 days old.	156 days	Killed	159 days	Each submaxillary gland contained two yellow gritty tubercles. The long Peyer's patch in the ileum had a finely fissured appearance (suggesting previous ulceration and subsequent regeneration). The intestine showed no lesions. The majority of the mesenteric glands were occupied by dry caseo-calcareous tissue; several of the terminal glands showed only a few discrete tubercles, yellow and gritty: the ileo-colic and colic glands contained similar tubercles. In the lung two grey translucent nodules were seen.

TABULAR SUMMARY OF FEEDING EXPERIMENTS ON THE CALF, PIG, GOAT, MONKEY, AND HORSE WITH CULTURES OF AVIAN TUBERCLE BACILLI—*continued.*

PIGS—*continued.*

Virus.	Source of Culture.	Number of Animal.	Weight when Fed in Kilos.	Date of Feeding.	Dose.	Generation and Age of Subculture Inoculated.	Total Period under Cultivation.	Duration of Life.	Result.
P. III.	Original material.	112	14·06	July 25, 1905, and six days following.	Growth from one serum tube each day for seven days.	8th generation	138 days	Killed. 51 days	In a left submaxillary gland a minute focus was seen (T.B. scanty). The mucous membrane of the small intestine showed numerous shallow ulcers; the Peyer's patches were severely affected, and in many the whole of the central parts was eroded away. The ulcers showed no appreciable thickening of the margins or bases, and the peritoneal surface was normal. The solitary follicles of the large intestine were conspicuous and opaque (smear, no T.B.). All the mesenteric glands were enlarged and firm, and showed whitish streaks and foci. The ileo-colic were similarly but less severely affected. The liver showed a small white body, and one kidney a grey point. A moderate number of T.B. were seen in a scraping from the mucous membrane of the small intestine. No T.B. were seen in smears from the organs or from a portal gland.

GOATS.

Virus.	Source of Culture.	Number of Animal.	Weight when Fed in Kilos.	Date of Feeding.	Dose.	Generation and Age of Subculture Inoculated.	Total Period under Cultivation.	Duration of Life.	Result.
P. II.	Original material.	34	22·22	Feb. 8, 1906	15·0 mg.	19th generation, 23 days old.	336 days	Killed. 132 days	In the ileum there were some greyish yellow foci (smear, a few T.B.). The majority of the mesenteric glands contained numerous irregular yellow calcareous tubercles up to a hempseed in size. The ileo-colic glands contained a few tubercles, as did a duodenal gland (smear, a few T.B.). There was no tuberculosis elsewhere.
A. II.	Original material.	38	—	March 1, 1907	100·0 mg.	9th generation, 20 days old.	353 days	Killed. 110 days	In the small intestine there were two soft caseous gritty nodules (smear, 1 T.B. seen). The coeliac glands contained irregular yellowish nodules and small patches of caseous slightly gritty substance (smear, no T.B.). One mesenteric gland contained soft caseous slightly gritty nodules (smear, 2 T.B. seen). A small grey patch was seen in the lung (smear, no T.B.). There were no tuberculous lesions elsewhere.
A. X.	Original material.	62	3·05	Jan. 28, 1909	50·0 mg.	15th generation, 5 days old.	739 days	Killed. 56 days	Peyer's patches and solitary follicles of small intestines were thickened, beset with caseous foci, and ulcerated. Large intestine normal. Each tonsil showed caseous streaks and foci. Caseation of submaxillary, right cervical, parotid, posterior pharyngeal, portal, mesenteric, and ileo-colic glands. A few foci in liver and lungs of doubtful nature. No tuberculosis elsewhere.
”	”	64	”	”	”	”	”	”	Peyer's patches thickened, ulcerated, and caseating. Crypts of tonsils lined by soft caseous substance (T.B.). Caseation of posterior pharyngeal, ileo-colic, and mesenteric glands. Caseous foci in submaxillary and portal glands. No tuberculosis elsewhere.

RHESUS MONKEYS.

A. I.	Original material.	162	—	Nov 22, 1906	50·0 mg	8th generation, 20 days old, etc.	279 days	Killed. 144 days	Normal throughout.
				Dec. 5, 1906	50·0 mg.		292 days		
				Jan. 8, 1907	50·0 mg.		326 days		
,,	,,	164	—	Nov. 22, 1906	500·0 mg.	8th generation. 20 days old.	279 days	Killed. 137 days	Normal throughout.
P. II.	Original material.	122	—	Nov. 30, 1905	About 10·0 mg.	15th generation. 21 days old.	266 days	Killed. 112 days	One mesenteric gland contained a yellow nodule filled with soft pus, in which no T.B. were found. There were no lesions elsewhere.
	,,	124	—	,,	1·0 mg.	,,	,,	,,	There were two nodules in the mesenteric glands similar to those in No. 122, and two small grey translucent bodies in the ileum. There were no lesions elsewhere.
P. XXI.	Original material.	156	—	Nov. 22, 1906	50·0 mg.	11th generation.	383 days	Killed. 151 days	Normal throughout.
				Dec. 5, 1906	100·0 mg.	22 days old. etc.	396 days		
				Jan. 8, 1907	100·0 mg.		430 days		

PONIES.

P. III.	Original material.	14	118·79	Jan. 29, 1908, and five following days.	600·0 mg.	27th generation	1066 days	Killed. 138 days	In the right tonsil there was a small collection of caseous gritty foci (smear, T.B.). Three left cervical glands contained each a single focus (smear, T.B.), two on the right side contained caseous gritty tubercles and patches (smear, T.B.). Nine of the mesenteric glands contained small caseous gritty nodules, usually in small number (smear, T.B.). The numerous small colic glands nearly all contained similar nodules up to a pea in size. The liver contained a moderate number of translucent tubercles (smear, no T.B.); the omentum small calcareous streaks and nodules (smear, a few T.B.); the lungs a few scattered translucent tubercles, one caseo-calcareous nodule and one yellow waxy nodule. A few minute foci were seen in the thoracic glands. In the muscle on the left side of the neck (site of the tuberculin inoculation) there was a fibrous thickening containing caseous foci (smear, T.B.).
A. VIII.	Original material.	4	212·64	Aug. 15, 1907	100·0 mg.	6th generation, 21 days old.	265 days	Killed. 160 days	Two minute opaque foci were seen in the small intestine. One mesenteric gland contained an opaque focus. No T.B. were seen in these lesions. There was no tuberculosis elsewhere.

TABULAR SUMMARY OF INOCULATION AND FEEDING EXPERIMENTS ON THE CALF, PIG, GOAT, AND MONKEY WITH TISSUE EMULSIONS CONTAINING AVIAN TUBERCLE BACILLI.

CALVES.

Virus.	Source of Tissue Emulsion.	Number of Animal.	Mode of Inoculation.	Weight at Inoculation in Kilos.	Date of Inoculation.	Dose.	Duration of Life.	Result.
A X.	Spleen of Calf 548.	550	Intrav.	46·25	July 9, 1907	20·0 cc. (T.B. numerous).	Died. 36 days	Small portions of the lungs were solid and airless; but the greater part, though congested and oedematous, was air-containing. The spleen was enlarged and dark red. The liver was speckled with very numerous minute foci. The portal glands showed yellowish necrotic patches. The thoracic and many other glands were congested and oedematous, but showed no visible tubercles. T.B. were numerous in the spleen, liver, lung and mediastinal gland, less numerous in kidney and in a scraping from the small intestine.
,,	Spleen of Calf 548.	554	,,	41·27	July 9, 1907	10·0 cc. (T.B. numerous).	Died. 35 days	The anterior portions of the lungs (nearly half) were dark red, solid and airless, and showed a fine greyish mottling. The posterior portions were congested and oedematous but still air-containing. The liver was speckled with minute greyish foci. The spleen was enlarged and firm. All the lymphatic glands were oedematous and many were congested, but showed no visible tubercles. T.B. were numerous in smears from the lung, liver and spleen, and in scrapings from the small intestine and a mediastinal gland: a moderate number was seen in a smear from the kidney.
,,	Spleen of Calf 550.	562	,,	35·83	August 14, 1907.	,,	Died. 32 days	The lungs were deeply congested and oedematous, especially the anterior portions; no part, however, was completely airless. Other organs and the glands appeared normal. T.B. were numerous in smears from the lung, spleen and liver, scanty in a smear from a kidney. Very numerous T.B. were seen in smears from the intestinal mucous membrane and a mesenteric gland.
,,	Liver of Calf 554.	560	,,	44·90	August 13, 1907.	9·0 cc. (T.B. numerous).	Died. 40 days	The anterior portions (more than half) of the lungs were dark red and airless presenting on section a mottled appearance; minute drops of pus could be expressed. The rest of the lungs showed only a few consolidated patches. The thoracic glands were congested and oedematous. The pelves of the kidneys were oedematous; so also were the mesenteric and peripheral glands. A smear from the lung showed T.B. very numerous; T.B. were numerous in smears from the liver, spleen, kidney, and a mesenteric gland; a few were seen in a smear from the prescapular gland.
,,	Liver of Calf 562.	558	,,	34·00	September 15, 1907.	5·0 cc. (T.B. moderately numerous).	Died. 45 days	The anterior lobes of the lung were to a great extent consolidated; part of the left caudal lobe was similar; elsewhere in the lung there were scattered pneumonic lobules. The condition was that of red hepatisation without any necrosis. The thoracic and portal glands were enlarged, and showed early caseation. The spleen was firm, and some necrotic patches were seen in it. An occasional focus was seen on the surface of the liver. The suprarenal bodies were beset with minute grey foci. The pelves of the kidneys and the lymphatic glands were oedematous. T.B. were numerous in smears from lung, liver and spleen (necrotic patch), very numerous in smears from intestinal mucous membrane, portal and bronchial glands, and scanty in kidney.

,,	Liver of Calf 560.	564	,,	50·80	September 23, 1907.	9·0 cc. (T.B. numerous).	Died. 45 days	The anterior halves of the lung were deeply congested, and portions were airless; the posterior halves were congested and oedematous. The thoracic glands were firm, congested, and closely beset with yellow foci. The spleen was firm, and showed several necrotic patches. The liver was congested. The portal glands showed a network of yellowish streaks and foci. The pelves of the kidneys, and many peripheral lymphatic glands, were oedematous. T.B. were numerous in smears from the organs, a mediastinal gland, and the small intestine.
,,	Liver of Calf 558.	566	,,	60·32	October 31, 1907.	5·0 cc. (150,000,000 T.B.).	Killed when ill. 43 days.	The right anterior and middle lobes were solid and airless; on section the lobules were grey in the centre, dark red around the margins, and many were softened and muco-purulent. The right posterior lobe was peppered with minute foci and showed small solid areas. The left lung was similar, but the anterior lobes were less extensively consolidated. The bronchi contained muco-pus. The thoracic glands were enlarged and caseated; the portal glands showed early caseous patches. The majority of the Peyer's patches contained a few slightly opaque and caseous elevations. The mesenteric glands were enlarged and showed a caseous network. The superior cervical glands contained each a caseating nodule; the pharyngeal glands showed a few opaque foci. A few scattered T.B. were seen in a smear from pneumonic lung; none in muco-pus from the lung, nor in smears from the liver and spleen. T.B. were numerous in emulsions of the mediastinal and mesenteric glands and in a tubercle from a Peyer's patch.
,,	Liver of Calf 564.	570	,,	64·85	November 7, 1907.	5·0 cc. (T.B. moderately numerous).	Died. 31 days	The right lung was dark red, solid, and airless, but showed no sign of caseation; the left lung was oedematous and congested. The thoracic glands were firmer than normal. The portal glands showed small early caseous patches. The spleen was enlarged. In the cortices of the kidneys were scattered pigmented oedematous pits containing whitish flakes (a smear showed T.B.). The lymphatic glands and tissues about the shoulders and neck were oedematous. T.B. were numerous in smears from the lung, liver, and spleen.
,,	Liver of Calf 566 (4th intravenous passage).	574	Subcut.	—	December 13, 1907.	10·0 cc. (No T.B. seen).	Killed. 109 days	There was no local lesion. The right prescapular gland contained six soft caseous tubercles. In the pleura of one lung was a minute glassy tubercle (smear, no T.B.). In the left bronchial gland was a small caseo-fibrous nodule, and around it were opaque foci and a few tubercles with caseous centres. There was a little group of opaque foci in the liver (smear, no T.B.).
,,	Liver of Calf 570 (4th intravenous passage).	572	,,	54·42	December 9, 1907.	9·0 cc. (T.B. moderately numerous).	Killed. 163 days	The local tumour was fibro-caseo-calcareous. In the adjacent prescapular gland were cystic nodules containing soft caseous substance. One soft grey nodule (smear, no T.B.) was seen in the lung; there was one nodule with an opaque centre (smear, no T.B.) in the liver; a caseo-calcareous tubercle (T.B. moderately numerous) was seen in a suprarenal body. One mesenteric gland showed a yellowish focus (smear, no T.B.).
,,	Liver of Calf 570 (4th intravenous passage).	576	,,	44·44	December 9, 1907.	7·0 cc. (T.B. moderately numerous).	Killed. 163 days	There was a slight linear thickening at the seat of inoculation. The left prescapular gland contained three small collections of caseo-calcareous granules. One left cervical gland was partly caseo-calcareous. The majority of the mesenteric and several colic glands contained either a few caseo-calcareous tubercles or a small caseous patch. Smears from either showed a few T.B.
					PIGS.			
A. VII.	Rabbit 1603 (lung, liver, spleen, kidneys).	246	Fed	27·66	March 11, 1908.	—	Killed. 93 days	All the mesenteric and colic glands contained caseous nodules slightly gritty; in some they were closely packed and confluent. On the surface of the lungs there was a group of minute foci and three or four translucent tubercles. No T.B. were seen in smears from the organs.

TABULAR SUMMARY OF INOCULATION AND FEEDING EXPERIMENTS ON THE CALF, PIG, GOAT, AND MONKEY WITH TISSUE EMULSIONS CONTAINING AVIAN TUBERCLE BACILLI—*continued.*

PIGS—*continued.*

Virus.	Source of Tissue Emulsion.	Number of Animal.	Mode of Inoculation.	Weight at Inoculation in Kilos.	Date of Inoculation.	Dose.	Duration of Life.	Result.
A. X.	Calf 566 (mesenteric gland).	**236**	Intrav.	26·76	December 13, 1907.	5·0 cc. (T.B. numerous).	Died. 120 days	The lungs were congested and showed in places reddish grey areas. They contained numerous translucent tubercles, the majority with calcareous centres. The mesenteric glands were firm and showed a fine yellow network. One submaxillary gland contained a yellow nodule and one iliac gland a grey nodule beset with purulent foci. A rectal gland was enlarged and softened. The skin of the animal was covered with scabs, in a smear from one of which acidfast bacilli were seen. T.B. were very numerous in the lesions and in a smear from the spleen, one or two were seen in a smear from the bone marrow.
,,	Calf 566 (spleen).	**234**	Fed	25·40	,,	Nearly whole of spleen.	Killed. 164 days	In one tonsil there was a soft brownish nodule (no T.B. seen) and in a left submaxillary gland a miliary caseous nodule was seen; T.B. were seen in a smear made from it. There were no tuberculous lesions elsewhere.
GOAT.								
A. X.	Calf 570 (liver).	**50**	Subcut.	30·38	December 9, 1907.	6·0 cc. (T.B. moderately numerous).	Killed when well. 240 days.	At the seat of inoculation in the subcutaneous tissues there were a few small fibrous nodules with yellow gritty contents. Left prescapular gland more than half cystic and filled with soft caseous gritty contents. No tuberculosis elsewhere.
RHESUS MONKEYS.								
A. X.	Calf 570 (liver).	**192**	Subcut.	—	December 9, 1907.	4·0 cc. (T.B. moderately numerous).	Died. 55 days	The local tumour consisted of a mass of caseo-purulent nodules set in translucent tissue. The axillary glands were a little enlarged: one showed two opaque foci. In one lung a single translucent tubercle was seen. There was no tuberculosis elsewhere.
,,	Calf 566 (mediastinal gland).	**194**	,,	—	December 13, 1907.	4·0 cc. (T.B. numerous).	Died. 51 days	The local tumour was a cyst containing necrotic tissue and some serous fluid; there was an ulcer in the overlying skin. There was no tuberculosis elsewhere.

INOCULATION AND FEEDING EXPERIMENTS ON CATS WITH AVIAN TUBERCLE BACILLI.

Virus.	Strain.	Number of Cat.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Dose.	Method of Inoculation.	Duration of Life.	Result.
			Initial.	Final.						
A. X.	Original material	100	2,220	1,600	January 29, 1909.	5 days old, 5th generation.	0·1 mg.	Intravenous	Killed 53 days.	The lungs did not collapse and were dark, congested, and oedematous. Bronchial glands were a little firm. A few T.B. in liver and none in lung, spleen, and kidney.
A. X.	„	98	3,200	1,830	January 28, 1909.	„	1·0 mg.	Intravenous	Died 48 days.	The animal was emaciated. The lungs were emphysematous and the kidneys pale. Liver and spleen appeared normal. A few T.B. in lung and liver, none in the spleen and kidney.
A. VII.	Guinea-pig 3197.	102	1,550	1,200	February 8, 1909.	31 days old, 2nd generation.	10·0 mg.	Intravenous	Killed 43 days.	The lungs did not collapse normally. The greater part of the dorsal surfaces of the anterior and posterior lobes was firm, grey, and semi-translucent; on section purulent fluid could be expressed. In the rest of the lungs were discrete caseating tubercles. Bronchial glands were enlarged and contained a few caseating tubercles. Caseous patches and tubercles in the mesenteric and ileo-colic glands. No tuberculosis elsewhere.
P. II.	Original material (Submaxillary gland of a pig).	62	—	—	September 25, 1905.	23 days old, 11th generation.	1·0 mg.	Intra-peritoneal.	Died 73 days.	Broad-bean sized mass of firm substance resembling glandular tissue at the seat of inoculation. The omentum was enormously enlarged and composed of similar tissue. In the small omentum and the gastro-splenic omentum were masses of similar tissue, and there were nodules deposited on the lower end of intestine. On the surfaces of the stomach and intestines are numerous semitransparent granulations. The mesentery and mesocolon showed numerous greyish filmy foci The inguinal, sternal, portal, coeliac, lumbar and iliac glands were enlarged. No tubercles were seen in the organs. Tubercle bacilli were very numerous in smears from the spleen, marrow, inguinal and sternal glands.
P. II.	Original material (Submaxillary gland of a pig).	64	—	—	September 25, 1905.	23 days old, 11th generation.	1·0 mg.	Sub-cutaneous.	Killed 134 days.	Flat thickening at seat of inoculation composed of translucent tissue externally and opaque white tissue internally. There was a pinhead tubercle in the liver, a softened white tubercle in the lung, and no tuberculosis elsewhere. Tubercle bacilli were found in the former lesion, none in the latter; none was found in a smear from the left inguinal gland.
P. III.	Original material (Submaxillary gland of a pig).	56	500	370	September 7, 1905.	21 days old, 10th generation.	1·0 mg.	Intra-peritoneal.	Died 16 days.	Omentum slightly thickened. Organs and glands appeared normal to the naked eye. There were numerous tubercle bacilli in the spleen and inguinal gland; a few in the liver.
P. III	Original material (Submaxillary gland of a pig).	60	550	400	September 7, 1905.	21 days old. 10th generation.	5·0 mg.	Intra-peritoneal.	Died 16 days.	Omentum, slightly thickened, showed small grey tubercles and lines of grey tissue. No disease elsewhere. Smear preparations showed swarms of tubercle bacilli in the sternal gland, numerous T.B. in the spleen and mesenteric gland, and a few in the liver.
P. III.	Original material (Submaxillary gland of a pig).	54	520	370	September 7, 1905.	21 days old, 10th generation.	1·0 mg.	Sub-cutaneous	Died 14 days.	No local lesion. A few grey points in the inguinal glands. No tuberculosis elsewhere. Smear preparations showed numerous tubercle bacilli in the inguinal and iliac glands; none in the spleen, liver and lung.

INOCULATION AND FEEDING EXPERIMENTS ON CATS WITH AVIAN TUBERCLE BACILLI—*continued.*

Virus.	Strain.	Number of Cat.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Dose.	Method of Inoculation.	Duration of Life.	Result.
			Initial.	Final.						
A. VII.	Original material (Spleen of a fowl).	**96**	1,650	1,300	March 12, 1907	21 days old, 4th generation.	1·0 mg.	Intra-peritoneal.	Died 69 days.	Omentum was thickened and retracted and consisted of translucent tissue with a caseous network. Small greyish-white patches on the surface of the lungs consisting of opaque foci. Smear preparations showed one tubercle bacillus in the lung, none in the spleen, liver, or kidney.
A. III.	Original material (Lung of a crane).	**92**	2,090	—	February 6, 1907.	22 days old, 4th generation.	10·0 mg.	Sub-cutaneous.	Died 49 days.	At the seat of inoculation there was a small ulcer communicating with a cavity, containing serum, in the subcutaneous tissue. One right axillary gland was enlarged and about half caseous; another was beset with caseous foci. There was no tuberculosis elsewhere; no tubercle bacilli were seen in smears from the organs.
A. III.	Organs of Rabbit 1236.	**94**	3,400	3,120	February 25, 1907.	—	—	Fed.	Killed 107 days.	The Peyer's patches of the small intestine showed some opaque foci (smear, four tubercle bacilli seen). There were no lesions elsewhere, but in two smears from the mesenteric glands a few tubercle bacilli were seen.

INTRAPERITONEAL INOCULATIONS OF GUINEA-PIGS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM BIRDS.

Virus.	Source of Culture.	Number of Guinea-pig.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
A. VIII.	Original material (Spleen of a fowl).	**2505**	420	250	May 28, 1907	21 days old, 4th generation.	186 days	100·0 mg.	Died 29 days.	Omentum thickened along free margin by grey tissue with purulent foci. Flat grey nodules with yellow centres on liver and diaphragm. Grey points in the spleen and liver. Lungs congested. Lumbar, pyloric, and sternal glands opaque.
A. III.	Original material (Lung of a demoiselle crane).	**2369**	350	260	February 6, 1907.	22 days old, 4th generation.	315 days	10·0 mg.	Died 13 days.	Omentum slightly thickened; thin fibrous layer on peritoneum. Spleen enlarged and red. Numerous grey foci in the liver. Pleural cavities filled with fluid; anterior lobes of lungs collapsed. Manubrial, sternal, and lumbar glands contained purulent nodules. Smear from spleen showed a few tubercle bacilli, from liver numerous.
A. VII.	Original material (Spleen of a fowl).	**2390**	700	530	March 12, 1907.	21 days old, 4th generation.	112 days	10·0 mg.	Died 17 days.	Post-mortem appearances similar to those of Guinea-pig 2369.

A. VIII.	Original material (Spleen of a fowl).	2506	310	220	May 28, 1907	21 days old, 4th generation.	186 days	10·0 mg.	Died 29 days.	Post-mortem appearances similar to those of Guinea-pig 2369.
A. III.	Original material (Lung of a demoiselle crane).	2368	350	260	February 6, 1907.	22 days old, 4th generation.	315 days	5·0 mg.	Died 13 days.	Post-mortem appearances similar to those of Guinea-pig 2369.
A. I.	Original material (Intestine of a touracou).	1975	550	680	April 26, 1906	21 days old, 4th generation.	70 days	1·0 mg.	Killed 229 days.	Omentum formed a sausage-shaped swelling, 2 cm in diameter, filled with caseo-pus. Caseous nodules in lumbar, portal, and sternal glands. No disease elsewhere.
A. II.	Original material (Spleen of a pigeon).	2038	600	280	May 22, 1906	21 days old, 4th generation.	69 days	1·0 mg.	Died 23 days.	Omentum thickened by translucent tissue containing opaque foci. Spleen enlarged and red; a few of the malpighian bodies slightly opaque. Numerous grey points in the liver. Opaque foci in lumbar, sternal, and pyloric glands.
A. II.	Original material (Spleen of a pigeon).	2385	520	340	March 1, 1907	20 days old, 9th generation.	352 days	1·0 mg.	Died 46 days.	Omentum contained several purulent nodules up to a pea. Spleen a little enlarged. Grey points in the liver. Lungs congested. Lumbar glands caseo-purulent. Opaque foci in a sternal and a bronchial gland. Smears from lung showed a few tubercle bacilli; from liver, spleen, and kidney, none.
A. III.	Original material (Lung of a demoiselle crane).	2145	600	550	July 14, 1906	22 days old, 4th generation.	108 days	1·0 mg.	Killed 184 days.	Purulent nodules in omentum and on peritoneum. Lumbar and sternal glands caseo-purulent. No disease elsewhere.
A. III.	Original material (Lung of a demoiselle crane).	2367	300	240	February 6, 1907.	22 days old, 4th generation.	315 days	1·0 mg.	Died 35 days.	Omentum retracted, contained two yellow nodules. An opaque focus in each sternal gland. Smears from lung, liver, and spleen showed a few tubercle bacilli.
A. III.	Original material (Lung of a demoiselle crane).	2370	430	280	February 6, 1907.	22 days old, 4th generation.	315 days	1·0 mg.	Died 19 days.	Omentum slightly retracted. Spleen a little enlarged. Purulent nodule embedded in liver. Smears from liver and spleen showed a few tubercle bacilli; from lung and kidneys none.
A. IV.	Original material (Liver of a pheasant).	2131	280	350	July 4, 1906	22 days old, 4th generation.	89 days	1·0 mg.	Killed 180 days.	Purulent nodules in omentum and one in abdominal muscle. A few grey points in the spleen. A few necrotic patches in the liver. Caseous foci in a lumbar gland. Pseudo-tuberculosis of mesenteric glands.
A. IV.	Original material (Liver of a pheasant).	2354	280	200	January 29, 1907.	21 days old, 7th generation.	298 days	1·0 mg.	Died 45 days.	Soft yellow nodules in omentum the size of hemp seed. Spleen enlarged, firm, and red. Lungs congested. Moderate number of tubercle bacilli in the lung, a few in the spleen, and none in the kidney or liver.
A. V.	Original material (Spleen of a pheasant).	2127	400	450	July 4, 1906	22 days old, 4th generation.	88 days	1·0 mg.	Killed 183 days.	Four purulent nodules in the omentum up to a pea and one in subcutaneous tissue. Caseo-purulent nodules in the lumbar and sternal gland.

INTRAPERITONEAL INOCULATIONS OF GUINEA-PIGS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM BIRDS—*continued.*

Virus.	Source of Culture.	Number of Guinea-pig.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
A. VI.	Original material (Spleen of a pheasant).	2625	420	250	September 21, 1907.	21 days old, 6th generation.	529 days	1·0 mg.	Died 56 days.	Resembled Guinea-pig 2354.
A. VII.	Original material (Spleen of a fowl).	2391	770	510	March 12, 1907	21 days old, 4th generation.	112 days	1·0 mg.	Died 29 days.	Omentum retracted and composed of grey tissue partly caseous. Peritoneum injected: fluid in peritoneal cavity. Spleen slightly enlarged. Grey points in the liver. Lungs congested and oedematous. No T.B. in smears from liver and spleen.
A. VIII.	Original material (Spleen of a fowl).	2503	320	260	May 28, 1907	21 days old, 4th generation.	186 days	1·0 mg.	Died 52 days.	Resembled Guinea-pig 2354 except that there was fluid in the peritoneal cavity and a layer of fibrin on the spleen.
A. VIII.	Original material (Spleen of a fowl).	3141	710	420	April 7 1908	22 days old, 8th generation.	501 days	1·0 mg.	Died 50 days.	Resembled Guinea-pig 2354. Smears from lungs and spleen showed a few tubercle bacilli; from liver and kidney none.
A. VIII.	Original material (Spleen of a fowl).	3142	580	350	April 7, 1908	22 days old, 8th generation.	501 days	1·0 mg.	Died 36 days.	Omentum slightly thickened. Lumbar glands enlarged. Smears from the spleen and liver showed a few tubercle bacilli.
A. X.	Original material (Lung of a fowl).	2556	220	180	July 9, 1907	21 days old, 5th generation.	161 days	1·0 mg.	Died 64 days.	Omentum slightly thickened Spleen enlarged, red, and mottled with grey foci. Lungs oedematous. Caseo-purulent nodules in manubrial, sternal and lumbar glands. A few tubercle bacilli in smears from the spleen and liver, none in the lung and kidney.
A. II.	Original material (Spleen of a pigeon).	2040	470	280	May 22, 1906	21 days old, 4th generation.	69 days	0·1 mg.	Died 84 days.	Discrete translucent foci in omentum. Large caseo-purulent cyst in spleen. Grey points in liver. Purulent nodules in inguinal glands. A few tubercle bacilli in smears from spleen, none in kidney and liver.
A. III.	Original material (Lung of a demoiselle crane).	2146	620	740	July 14, 1906	22 days old, 4th generation.	108 days	0·1 mg.	Killed 184 days.	Caseo-purulent nodule in omentum, and purulent nodule containing numerous tubercle bacilli in subcutaneous tissue. No disease elsewhere.
A. IV.	Original material (Liver of a pheasant).	2132	430	400	July 4, 1906	22 days old, 4th generation.	89 days	0·1 mg.	Died 49 days.	Caseo-purulent nodule the size of a pea in abdominal muscle. Five similar nodules in omentum. Soft yellow focus in a bronchial gland. No tuberculosis elsewhere.
A. VI.	Original material (Spleen of a pheasant).	2624	400	240	September 21, 1907.	21 days old, 6th generation.	529 days	0·1 mg.	Died 57 days.	In omentum there was a collection of caseo-purulent nodules. On the peritoneum there were a few grey tubercles. Spleen red and swollen. Grey points in the liver. Lungs congested and oedematous. Purulent nodule in a lumbar gland. Smears from liver and spleen showed moderately numerous tubercle bacilli.

A. X.	Original material (Lung of a fowl).	2555	140	350	July 9, 1907	21 days old, 5th generation.	161 days	0·1 mg.	Killed 202 days.	Purulent nodule the size of a hemp seed in omentum. Right sternal gland opaque and softened. No disease elsewhere.
A. V.	Original material (Spleen of a pheasant).	2128	440	780	July 4, 1906	22 days old, 4th generation.	88 days	0·01 mg.	Killed 182 days	Animal healthy.

INTRAPERITONEAL INOCULATIONS OF GUINEA-PIGS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM SWINE.

P. II.	Original material (Submaxillary gland of a pig).	1533	400	260	May 3, 1905	33 days old, 3rd generation.	55 days	5·0 mg.	Died 19 days.	Omentum contained numerous grey tubercles with yellow centres. Peritoneum congested. Mesentery slightly thickened. Spleen enlarged and red. Grey foci in the liver. Cephalic lobes of lungs solid; other lobes showed patches of consolidation. Pleural cavities filled with fluid. Portal, lumbar, and iliac glands showed opaque foci. Numerous tubercle bacilli in smear preparations.
P. III.	Original material (Submaxillary gland of a pig).	1594	1070	920	June 15, 1905	21 days old, 5th generation.	98 days	5·0 mg.	Died 9 days.	Post-mortem appearances resembled the above except that the spleen was not enlarged, and the liver was pale without foci visible.
P. II.	Original material (Submaxillary gland of a pig).	1530	460	270	May 3, 1905	33 days old, 3rd generation.	55 days	1·0 mg.	Died 24 days.	Omentum, thickened, retracted and adherent, was beset with yellow softened areas. Spleen enlarged and red. Lungs, liver, and kidneys normal. Sternal glands soft and yellow. Opaque focus in the portal gland. Lung, liver, and spleen showed a few tubercle bacilli. Very numerous in sternal gland.
P. II.	Original material (Submaxillary gland of a pig).	1531	240	180	May 3, 1905	33 days old, 3rd generation.	55 days	1·0 mg.	Died 52 days.	Omentum slightly thickened. Pea-sized nodule in muscle wall. Lungs slightly congested. Smears from liver, spleen, lungs, and kidney showed no tubercle bacilli.
P. XXI.	Original material (Submaxillary gland of a pig).	1912	700	440	February 19, 1906.	21 days old, 4th generation.	77 days	1·0 mg.	Died 30 days.	Omentum consisted of translucent tissue beset with yellow streaks and foci. Mesentery contracted. Spleen enlarged, firm, and red. Pleural cavities filled with fluid and fibrin. Right lung dark and collapsed; scattered solid areas in the left. Liver, kidneys, &c. normal. Smears from liver, lung, and spleen showed a few tubercle bacilli.
P. XLIV.	Original material (Submaxillary gland of a pig).	2284	600	620	January 4, 1907.	22 days old, 5th generation.	190 days	1·0 mg.	Killed 94 days.	Omentum contained two soft yellow miliary nodules. No disease elsewhere. Smear from nodule showed moderately numerous tubercle bacilli.

INTRAPERITONEAL INOCULATIONS OF GUINEA-PIGS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM SWINE—*continued.*

Virus.	Source of Culture.	Number of Guinea-pig.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
P. II.	Original material (Submaxillary gland of a pig).	**1718**	290	210	September 25, 1905.	23 days old, 11th generation.	200 days	0·1 mg.	Died 94 days.	Omentum and peritoneum normal. The caudal lobes of the lungs showed solid grey areas with caseous foci; there were grey foci in the other lobes. The axillary glands were enlarged. Smears from the lung and axillary gland showed numerous tubercle bacilli. None in kidney, liver, and spleen.
P. XLIV.	Original material (Submaxillary gland of a pig).	**2282**	380	300	January 4, 1907.	22 days old, 5th generation.	190 days	0·1 mg.	Died 94 days.	Omentum contained six grey tubercles with soft yellow centres; a yellow nodule on peritoneum. The lungs showed two caseous nodules and scattered translucent foci. Bronchial glands normal. No disease elsewhere. Cultures from the lungs were typically avian in character.

SUBCUTANEOUS INOCULATIONS OF GUINEA-PIGS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM BIRDS.

A. VI.	Original material (Spleen of a pheasant).	**2623**	370	530	September 21, 1907.	21 days old, 6th generation.	529 days	100·0 mg.	Killed 171 days.	No local lesion visible. Both scapular glands were caseous and soft. No tuberculosis elsewhere.
A. VIII.	Original material (Spleen of a fowl).	**2504**	170	550	May 28, 1907	21 days old, 4th generation.	186 days	100·0 mg.	Killed 149 days.	Cicatricial tissue at the seat of inoculation. No disease elsewhere.
A. II.	Original material (Spleen of a pigeon).	**2386**	470	320	March 1, 1907	20 days old, 9th generation.	352 days	50·0 mg.	Died 50 days.	Small ulcer in skin. Soft yellow nodule in right inguinal gland. No disease elsewhere.
A. VI.	Original material (Spleen of a pheasant).	**2622**	470	760	September 21, 1907.	21 days old, 6th generation.	529 days	50·0 mg.	Killed 171 days.	In subcutaneous tissue there was a reddish grey nodule with opaque foci. Purulent nodules in the inguinal glands. No disease elsewhere.
A. VIII.	Original material (Spleen of a fowl).	**2595**	150	450	August 15, 1907	21 days old, 6th generation.	265 days	50·0 mg.	Killed 163 days.	No local lesion visible. Purulent nodules in an axillary gland. No disease elsewhere.

A. VIII.	Original material (Spleen of a fowl).	2596	150	130	August 15, 1907	21 days old, 6th generation.	265 days	50·0 mg.	Died 61 days.	Ulcer in skin of back with caseo-pus beneath the margins, and a few nodules in subcutaneous tissue around. Purulent focus in an axillary gland. Smears from lung, liver, and kidney showed no tubercle bacilli; from spleen three tubercle bacilli.
A. VIII.	Original material (Spleen of a fowl).	2597	240	470	August 15, 1907	21 days old, 6th generation.	265 days	50·0 mg.	Killed 163 days.	Purulent nodule in subcutaneous tissue, and one in left axillary gland. No disease elsewhere.
A. X.	Original material (Lung of a fowl).	2917	390	340	November 27, 1907.	21 days old, 7th generation.	313 days	50·0 mg.	Died 106 days.	Small caseous ulcer in skin of abdomen. Caseo-purulent nodules in the inguinal glands. No disease elsewhere.
A. X.	Original material (Lung of a fowl).	2918	350	290	November 27, 1907.	21 days old, 7th generation.	313 days	50·0 mg.	Died 99 days.	Purulent nodule in subcutaneous tissue. Inguinal gland caseo-purulent. No disease elsewhere.
A. II.	Original material (Spleen of a pigeon).	2037	470	650	May 22, 1906	21 days old, 4th generation.	69 days	10·0 mg.	Killed 198 days.	Small papilla at seat of inoculation. Soft yellow nodules in each inguinal gland. No disease elsewhere.
A. III.	Original material (Lung of a demoiselle crane).	2143	550	750	July 14, 1906	22 days old, 4th generation.	108 days	10·0 mg.	Killed 184 days.	Pea-sized nodule filled with caseo-pus, and a few yellow foci in the muscle. No disease elsewhere.
A. III.	Original material (Lung of a demoiselle crane).	2144	650	650	July 14, 1906	22 days old, 4th generation.	108 days	10·0 mg.	Killed 184 days.	Four flattened yellow nodules in subcutaneous tissue. No tuberculosis elsewhere.
A. IV.	Original material (Liver of a pheasant).	2129	320	750	July 4, 1906	22 days old, 4th generation.	89 days	10·0 mg.	Killed 182 days.	No local lesion. Purulent nodule in axillary gland. Animal otherwise healthy.
A. V.	Original material (Spleen of a pheasant).	2125	490	400	July 4, 1906	22 days old, 4th generation.	88 days	10·0 mg.	Died 127 days.	Two purulent nodules in subcutaneous tissue of back. Nearest glands a little enlarged; purulent foci in portal glands; hip joints a little swollen by mucinous fluid. No tuberculosis elsewhere. Smears from spleen, liver, and kidney showed no tubercle bacilli; few in the lungs and in each hip joint.
A. V.	Original material (Spleen of a pheasant).	2126	500	850	July 4, 1906	22 days old, 4th generation.	88 days	10·0 mg.	Killed 182 days.	No sign of tuberculosis.
A. VII.	Original material (Spleen of a fowl).	2389	650	520	March 12, 1907	21 days old, 4th generation.	112 days	10·0 mg.	Died 37 days.	Ulcer in skin of abdomen with caseous base. Soft caseous nodule in inguinal gland. Smear from spleen showed no tubercle bacilli.
A. X.	Original material (Lung of a fowl).	2557	210	570	July 9, 1907	21 days old, 5th generation.	161 days	10·0 mg.	Killed 202 days.	No sign of tuberculosis.

SUBCUTANEOUS INOCULATIONS OF GUINEA-PIGS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM BIRDS—*continued.*

Virus.	Source of Culture.	Number of Guinea-pig.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
A. I.	Original material (Intestine of a touracou).	**1974**	540	820	April 26, 1906	21 days old, 4th generation.	70 days	1·0 mg.	Killed 229 days.	No local lesion. Purulent nodules in inguinal glands; smaller similar nodules in portal, bronchial, and sternal glands. Smears from these four glands showed in each a few tubercle bacilli. No disease elsewhere.
A. II.	Original material (Spleen of a pigeon).	**2039**	520	320	May 22, 1906	21 days old, 4th generation.	69 days	1·0 mg.	Died 11 days.	Purulent foci in the skin and the inguinal glands. Smears from the spleen showed one tubercle bacillus; from the liver, lung, kidney, and bone marrow none.
A. IV.	Original material (Liver of a pheasant).	**2130**	340	1,080	July 4, 1906	22 days old, 4th generation.	89 days	1·0 mg.	Killed 183 days.	Purulent nodule in subcutaneous tissue of the back (seat of inoculation). No disease elsewhere.
A. IV.	Original material (Liver of a pheasant).	**2356**	320	300	January 29, 1907	21 days old, 7th generation.	298 days	1·0 mg.	Died 80 days.	Soft caseous nodule in subcutaneous tissue. Purulent nodules in inguinal glands. No tuberculosis elsewhere. Smears from lung and spleen showed no tubercle bacilli.

SUBCUTANEOUS INOCULATIONS OF GUINEA-PIGS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM SWINE.

P. II.	Original material (Submaxillary gland of a pig).	**2575**	440	640	July 16, 1907	21 days old, 31st generation.	859 days	10·0 mg.	Killed 193 days.	Small scab at the seat of inoculation only.
P. II.	Original material (Submaxillary gland of a pig).	**2576**	470	590	July 16, 1907	21 days old, 31st generation.	859 days	10·0 mg.	Killed 193 days.	No local lesion. Purulent nodule in an inguinal gland. No disease elsewhere.
P. III.	Original material (Submaxillary gland of a pig).	**2969**	270	220	January 29, 1908.	21 days old, 27th generation.	1,056 days	10·0 mg.	Died 36 days.	Ulcer with soft caseous margins in the skin of the back. Nearest glands slightly enlarged. Spleen a little enlarged. Smear from spleen showed no tubercle bacilli.

P. III.	Original material (Submaxillary gland of a pig).	2970	450	300	January 29, 1908.	21 days old, 27th generation.	1,056 days	10·0 mg.	Died 39 days.	Small ulcer in skin of abdomen with purulent substance beneath the margins. Purulent nodule in inguinal gland. No other disease.
P. XXI.	Original material (Submaxillary gland of a pig).	2034	470	240	May 22, 1906	21 days old, 8th generation.	169 days	10·0 mg.	Died 28 days.	Ulcer in skin covered with a caseous scab. Caseo-purulent nodules in the inguinal glands. Minute grey foci in the liver. No tubercle bacilli seen in smears from the liver, lungs, and spleen Cultures grown directly from the liver avian in type.
P. XLIV.	Original material (Submaxillary gland of a pig).	2283	480	680	January 4, 1907.	22 days old, 5th generation.	190 days	10·0 mg.	Killed 152 days.	Linear scar in skin of abdomen. Purulent nodule in each inguinal gland. No disease elsewhere.
P. II.	Original material (Submaxillary gland of a pig).	1591	950	670	June 14, 1905	21 days old, 5th generation.	97 days	5·0 mg.	Died 15 days	Congested necrotic nodule in subcutaneous tissue. Yellow foci in an inguinal gland. A few tubercle bacilli in a smear from spleen.
P. II.	Original material (Submaxillary gland of a pig).	1532	240	180	May 3, 1905	33 days old, 3rd generation.	55 days	1·0 mg.	Died 54 days.	Small healing ulcer in skin of abdomen. Purulent nodules in the inguinal glands. Yellowish grey foci in the liver. Smears from lung, bronchial gland, and spleen showed no tubercle bacilli; from the liver and inguinal gland numerous tubercle bacilli.
P. II.	Original material (Submaxillary gland of a pig).	2035	550	300	May 22, 1906	21 days old, 24th generation.	439 days	1·0 mg.	Died 24 days.	Purulent nodule and ulcer in skin Soft yellow nodules in inguinal glands. Grey foci in the liver. Culture from liver produced moderately numerous tubercle colonies. Smears from liver and spleen showed no tubercle bacilli.
P. II.	Original material (Submaxillary gland of a pig).	2036	580	700	May 22, 1906	21 days old, 24th generation.	439 days	1·0 mg.	Killed 198 days.	No local lesion. Purulent nodules in each inguinal gland.
P. XXI.	Original material (Submaxillary gland of a pig).	1911	670	640	February 19, 1906.	21 days old, 4th generation.	77 days	1·0 mg	Killed 116 days.	Small scar at seat of inoculation. No tuberculosis elsewhere.
P. XXI	Original material (Submaxillary gland of a pig).	2033	390	200	May 22, 1906	21 days old, 8th generation.	169 days	1·0 mg.	Died 28 days.	Ulcer with caseous base in skin of abdomen. Purulent nodules in the inguinal glands. Grey foci in the liver. Smears from liver, lungs, and spleen showed no tubercle bacilli. Culture grown directly from the liver was avian in type.
P. XXVII.	Original material (Submaxillary gland of a pig).	1913	760	740	February 22, 1906.	21 days old, 4th generation.	73 days	1·0 mg.	Killed 113 days.	Soft yellowish nodule in each inguinal gland. No disease elsewhere.

SUBCUTANEOUS INOCULATIONS OF GUINEA-PIGS WITH CULTURES OF AVIAN TUBERCLE BACILLI DERIVED FROM SWINE—*continued.*

Virus.	Source of Culture.	Number of Guinea-pig.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
P. XLIV.	Original material (Submaxillary gland of a pig).	**2281**	320	650	January 4, 1907.	22 days old, 5th generation.	190 days	1·0 mg.	Killed 152 days.	No local lesion. Purulent nodule in an inguinal gland. Animal otherwise healthy.
P. III.	Original material (Submaxillary gland of a pig).	**1717**	270	180	September 25, 1905.	23 days old, 11th generation.	200 days	0·1 mg.	Died 107 days.	No local lesion visible. Purulent nodules in the inguinal glands. No tuberculosis elsewhere. Smears from inguinal gland showed moderately numerous tubercle bacilli; from the spleen and lung no tubercle bacilli.

SUBCUTANEOUS INOCULATIONS OF GUINEA-PIGS WITH CULTURES OF AVIAN TUBERCLE BACILLI AFTER PASSAGE THROUGH ANIMALS.

P. II.	Pig 104	**1923**	550	—	March 2, 1906	43 days old, 2nd generation.	233 days	Not estimated.	Died 21 days.	Small ulcer. Purulent nodules in the inguinal glands.
P. III.	Calf 282	**1922**	420	250	March 2, 1906	42 days old, 2nd generation.	235 days	„	Died 104 days.	No local lesion. Soft yellow nodules in the iliac glands. Three translucent foci in the lungs and minute opaque foci in a bronchial gland. Other organs and glands normal.
P. III.	Calf 318	**1921**	790	450	March 2, 1906	35 days old, 2nd generation.	81 days	„	Died 19 days.	Small purulent nodule in subcutaneous tissue. Inguinal glands a little enlarged. No tubercle bacilli in smears from the spleen, lung, and inguinal gland.
P. III.	G.P. 1613	**1901**	300	400	February 9, 1906.	38 days old, 2nd generation.	87 days	„	Killed 34 days.	Shallow caseous ulcer in the skin. Soft yellow nodules in inguinal and right iliac glands.
P. III.	Calf 282	**1944**	400	350	March 22, 1906	77 days old, 2nd generation.	261 days	„	Killed 84 days.	Caseo-purulent nodule in subcutaneous tissue. Right inguinal gland filled with caseo-pus. Soft yellow tubercles in sternal gland.
P. III.	Calf 282	**1945**	420	210	March 22, 1906	77 days old, 2nd generation.	261 days	„	Died 20 days.	Small ulcer in skin. Soft caseous nodules in inguinal glands.
P. III.	G.P. 1901	**1976**	420	760	April 28, 1906	16 days old, 2nd generation.	44 days	One tube	Killed 107 days.	No local lesion visible. Left inguinal gland the size of a pea, filled with caseo-pus.
P. III.	Calf 318	**2446**	300	640	April 25, 1907	142 days old on glycerin broth, 7th generation.	500 days	1·0 mg.	Killed 113 days.	Small scar in skin of the back and a few caseo-purulent streaks in subcutaneous tissues. No disease elsewhere.
P. III.	Calf 318	**2447**	270	620				100·0 mg.	Killed 113 days.	In the subcutaneous tissue there was a soft grey nodule beset with purulent foci, also a caseo-purulent cyst. No disease elsewhere.
P. III.	Calf 318	**2448**	270	550				200·0 mg.	Killed 113 days.	Small purulent cyst in subcutaneous tissue of the back. Animal otherwise healthy.

A. IV.	Calf 494	2903	280	290	November 8, 1907.	21 days old, 4th generation.	129 days	50·0 mg.	Died 118 days.	Soft caseous nodule in subcutaneous tissue of the back and small ulcer in the skin. Purulent nodule in scapular gland Smear from spleen showed no tubercle bacilli.
A. IV.	Calf 494	2904	230	250	November 8, 1907.	21 days old, 4th generation.	129 days	10·0 mg.	Died 120 days.	No local lesion visible. Scapular gland contained caseo-purulent nodules.

FEEDING EXPERIMENTS ON GUINEA-PIGS WITH CULTURES OF AVIAN TUBERCLE BACILLI.

Virus.	Source of Culture.	Number of Guinea-pig.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Duration of Life.	Result.
			Initial.	Final.						
A. I.	Original material (Intestine of a touracou).	2218	370	540	November 22, 1906.	22 days old, 8th generation.	280 days	10·0 mg.	Killed 102 days.	Animal healthy.
A. I.	Original material (Intestine of a touracou).	2219	440	520	November 22, 1906.	22 days old, 8th generation.	280 days	30·0 mg.	Killed 102 days.	Animal healthy.
P. II.	Original material (Submaxillary gland of a pig).	2248	520	740	November 28, 1906.	23 days old, 26th generation.	629 days	10·0 mg.	Killed 96 days.	Animal healthy.
P. II.	Original material (Submaxillary gland of a pig).	2249	540	700	November 28, 1906.	23 days old, 26th generation.	629 days	50·0 mg.	Killed 96 days.	The mesenteric glands were enlarged and showed a few small patches of necrosis in the cortices. An ileo-colic gland contained three opaque foci. The caecum showed translucent patches with minute opaque foci. Smears from the caecum and ileo-colic gland each showed a few tubercle bacilli.
P. III.	Original material (Submaxillary gland of a pig).	2250	540	720	November 28, 1906.	21 days old, 20th generation.	629 days	10·0 mg.	Killed 96 days.	Animal healthy.
P. III.	Original material (Submaxillary gland of a pig).	2251	540	770	November 28, 1906.	21 days old, 20th generation.	629 days	50·0 mg.	Killed 96 days.	Animal healthy.
P. XXI.	Original material (Submaxillary gland of a pig).	2220	620	420	November 22, 1906.	22 days old, 11th generation.	353 days	10·0 mg.	Died 99 days.	No tuberculosis.
P. XXI.	Original material (Submaxillary gland of a pig).	2221	470	580	November 22, 1906.	22 days old, 11th generation.	353 days	10·0 mg.	Killed 102 days.	Animal healthy.

INOCULATION EXPERIMENTS ON GUINEA-PIGS WITH EMULSIONS OF TUBERCULOUS MATERIAL (AVIAN).

Virus.	Material used.	Number.	Weight in Grammes.		Date of Inoculation.	Duration of Life.	Method of Inoculation.	Result.
			Initial.	Final.				
A. I.	Original material (Intestinal nodule from a touracou).	1908	360	230	February 16, 1908	Died 19 days	Intraperitoneal	Acute disease. Tubercle bacilli numerous in smear preparations.
"	Original material (Intestinal nodule from a touracou).	1907	440		February 16, 1908	Killed 119 days	Subcutaneous	No tuberculosis.
"	Spleen of Monkey 160	2261	400	300	December 11, 1906	Died 49 days	Subcutaneous	Caseo-purulent local lesion. Opaque focus in axillary gland.
"	Spleen of Monkey 160	2262	500		December 11, 1906	Killed 83 days	Subcutaneous	Animal healthy.
A. II.	Original material (Spleen of a pigeon).	1932	500	600	March 14, 1906	Killed 108 days	Subcutaneous	Caseo-purulent local lesion only.
A. III.	Local lesion of Calf 520	2512	260	570	June 8, 1907	Killed 107 days	Intraperitoneal	Caseo-purulent nodule in omentum only.
"	Local lesion of Calf 520	2513	200	460	June 8, 1907	Killed 107 days	Intraperitoneal	Similar to above.
"	Prescapular gland of Calf 520.	2514	270	560	June 8, 1907	Killed 107 days	Intraperitoneal	Similar to above.
"	Prescapular gland of Calf 520.	2515	280	500	June 8, 1907	Killed 107 days	Intraperitoneal	Similar to above.
"	Local lesion of Goat 40	2518	230	450	June 14, 1907	Killed 118 days	Intraperitoneal	Two purulent cysts in omentum.
"	Local lesion of Goat 40	2519	220	590	June 14, 1907	Killed 153 days	Intraperitoneal	Two miliary nodules in omentum.
"	Prescapular gland of Goat 40.	2516	250	530	June 14, 1907	Killed 153 days	Intraperitoneal	Resembled Guinea-pig 2518.
"	Prescapular gland of Goat 40.	2517	280	520	June 14, 1907	Killed 118 days	Intraperitoneal	Miliary nodule in omentum.
"	Lung of Goat 40	2521	270	620	June 14, 1907	Killed 153 days	Intraperitoneal	Three caseo-purulent nodules in omentum.
"	Mesenteric gland of Goat 40.	2520	320	550	June 14, 1907	Killed 153 days	Intraperitoneal	Single caseo-purulent nodule in omentum.
"	Original material (Lung of a crane).	1956	570	550	March 28, 1906	Killed 94 days	Subcutaneous	Caseo-purulent local lesion only.
"	Original material (Lung of a crane).	1957	500	390	March 28, 1906	Killed 94 days	Subcutaneous	Ulcer in skin. Opaque foci in an inguinal gland.
A. IV.	Left local lesion of Calf 494.	2549	340	570	July 2, 1907	Killed 153 days	Intraperitoneal	Four purulent nodules in omentum only.
"	Left local lesion of Calf 494.	2550	310	660	July 2, 1907	Killed 196 days	Intraperitoneal	Two purulent nodules in omentum.
"	Left prescapular gland of Calf 494.	2547	450	600	July 2, 1907	Killed 153 days	Intraperitoneal	Resembled Guinea-pig 2549.
"	Left prescapular gland of Calf 494.	2548	360	580	July 2, 1907	Killed 196 days	Intraperitoneal	No tuberculosis

"	Right local lesion of Calf 494.	**2546**	340	630	July 2. 1907	Killed 196 days	Intraperitoneal	No tuberculosis.
"	Right prescapular gland of Calf 494.	**2545**	370	510	July 2, 1907	Killed 153 days	Intraperitoneal	No tuberculosis
"	Local lesion of Calf 568	**3170**	350	270	May 8, 1908	Killed 57 days	Subcutaneous	Animal healthy.
"	Local lesion of Calf 568	**3171**	410	640	May 8, 1908	Killed 113 days	Subcutaneous	Animal healthy.
"	Prescapular gland of Calf 568.	**3168**	390	480	May 8, 1908	Killed 57 days	Subcutaneous	Soft caseous tumour the size of a thrush's egg. Opaque focus in a portal gland.
"	Prescapular gland of Calf 568.	**3169**	350	610	May 8, 1908	Killed 113 days	Subcutaneous	Small scar at seat of inoculation. Purulent nodule in an inguinal gland.
A. V.	Lung of Rabbit 958	**2242**	400	730	November 27, 1906	Killed 55 days	Intraperitoneal	A single soft caseous nodule in the omentum.
"	Kidney of Rabbit 958	**2243**	320	730	November 27, 1906	Killed 55 days	Intraperitoneal	Caseo-purulent nodules in omentum.
"	Lung of Rabbit 1211	**2407**	750	710	March 28, 1907	Killed 69 days	Intraperitoneal	Caseo-purulent nodules in omentum. Opaque foci in portal and lumbar glands.
"	Lung of Rabbit 1211	**2408**	920	810	March 28, 1907	Killed 69 days	Intraperitoneal	Similar to the above.
"	Kidney of Rabbit 1211	**2406**	980	810	March 28, 1907	Killed 69 days	Intraperitoneal	Similar to the above.
"	Elbow joint of Rabbit 1363.	**2732**	490	400	October 10, 1907	Killed 96 days	Intraperitoneal	In the omentum there were eight soft yellow nodules up to a pea in size; scattered tubercles on the peritoneum. Spleen enlarged. Grey foci in the liver. Miliary tubercle in a kidney. (T.B.)
"	Testis of Rabbit 1361	**2923**	350	380	November 29, 1907.	Killed 16 days	Intraperitoneal	Two small nodules in the omentum.
"	Testis of Rabbit 1361	**2924**	390	320	November 29, 1907.	Died 137 days	Intraperitoneal	Purulent nodule embedded in the liver. No other disease.
"	Original material (Liver of a pheasant).	**1962**	750	620	April 7, 1906	Killed 109 days	Subcutaneous	Small nodule under skin. Inguinal glands large and softened. In the lungs there were eight caseating nodules up to 9 mm. by 4 mm. Purulent nodules in the axillary, portal and bronchial glands. Animal otherwise normal. Cultures from lung nodule avian in type.
A. VII.	Lung of Pig 180	**2534**	170	460	June 25, 1907	Killed 153 days	Intraperitoneal	No tuberculosis.
"	Liver of Pig 180	**2533**	170	420	June 25, 1907	Killed 153 days	Intraperitoneal	Three caseo-purulent nodules in omentum.
"	Submaxillary gland of Pig 176.	**2963**	330	250	January 21, 1908	Died 52 days	Intraperitoneal	No tuberculosis.
"	Mesenteric gland of Pig 176.	**2962**	300	280	January 21, 1908	Died 58 days	Intraperitoneal	Two nodules the size of a wheat grain in omentum.
"	Iliac gland of Pig 176	**2964**	—	250	January 21, 1908	Died 40 days	Intraperitoneal	No tuberculosis.
"	Mesenteric gland of Pig 246.	**3198**	420	600	June 12, 1908	Killed 103 days	Intraperitoneal	Purulent nodule the size of a hemp seed in omentum.
"	Mesenteric gland of Pig 246.	**3199**	340	560	June 12, 1908	Killed 103 days	Intraperitoneal	Animal healthy.
"	Mesenteric gland of Pig 246.	**3197**	380	670	June 12, 1908	Killed 103 days	Subcutaneous	In the subcutaneous tissues there were several collections of caseo-pus. Purulent nodules in both inguinal glands, and the right iliac gland. No disease elsewhere.
"	Inguinal gland of Pig 180.	**2535**	300	670	June 25, 1907	Killed 153 days	Subcutaneous	No local lesion. Purulent foci in the inguinal glands.

INOCULATION EXPERIMENTS ON GUINEA-PIGS WITH EMULSIONS OF TUBERCULOUS MATERIAL (AVIAN)—*continued.*

Virus.	Material used.	Number.	Weight in Grammes.		Date of Inoculation.	Duration of Life.	Method of Inoculation.	Result.
			Initial.	Final.				
A. VIII.	Mesenteric gland of Pig 180.	2532	800	710	June 25, 1907	Killed 153 days	Subcutaneous	Soft nodules under skin and in inguinal glands.
"	Local lesion of Goat 54.	3190	360	610	May 22, 1908	Killed 103 days	Subcutaneous	Caseo-purulent nodule in subcutaneous tissue and in one inguinal gland.
"	Prescapular gland of Goat 54.	3189	320	550	May 22, 1908	Killed 103 days	Subcutaneous	Seven caseo-purulent nodules in subcutaneous tissue. Similar small nodules in one inguinal gland.
"	Cervical gland of Goat 54.	3192	350	500	May 22, 1908	Killed 103 days	Subcutaneous	Animal healthy.
"	Mesenteric gland of Goat 54.	3191	390	610	May 22, 1908	Killed 103 days	Subcutaneous	Animal healthy.
"	Organs of Guinea-pig 2506.	2509	320	340	June 6, 1907	Died 56 days	Intraperitoneal	Caseo-purulent cyst in omentum the size of a pigeon's egg. Pseudo-tuberculosis of the spleen, liver, mesenteric, and ileo-colic glands.
"	Lung of Calf 544.	2541	200	450	July 1, 1907	Killed 154 days	Intraperitoneal	In omentum there were eight cystic nodules. Calcareous granules in a portal gland. Purulent nodules in a sternal gland.
"	Lung of Calf 544.	2539	200	400	July 1, 1907	Killed 154 days	Subcutaneous	No local lesion. Purulent focus in each inguinal gland.
"	Lung of Calf 544.	2540	200	520	July 1, 1907	Killed 154 days	Subcutaneous	Similar to above.
A. X.	Original material (Lung of a fowl through a rabbit).	2347	340	270	January 29, 1907	Died 26 days	Intraperitoneal	Acute tuberculosis of the usual (avian) type.
"	Lung of Calf 546	2542	170	580	July 1, 1907	Killed 158 days	Intraperitoneal	Caseo-purulent nodules under skin and in inguinal glands.
"	Lung of Calf 546	2544	220	560	July 1, 1908	Killed 158 days	Intraperitoneal	Animal healthy.
"	Liver of Calf 546	2543	220	500	July 1, 1908	Killed 158 days	Intraperitoneal	Purulent focus in each inguinal gland.
"	Liver of Calf 554	2589	300	170	August 13, 1907	Died 37 days	Intraperitoneal	Two tubercles in omentum. Enlargement of spleen. Opaque patches in lumbar and sternal glands. Numerous T.B. in spleen, lungs and sternal gland.
"	Liver of Calf 554	2591	380	210	August 13, 1907	Died 39 days	Intraperitoneal	Similar to Guinea-pig 2589, except that the sternal gland was normal.
"	Spleen of Calf 550	2592	330	180	August 14, 1907	Died 38 days	Intraperitoneal	Similar to Guinea-pig 2589.
"	Spleen of Calf 550	2594	350	180	August 14, 1907	Died 44 days	Intraperitoneal	Resembled Guinea-pig 2589.
"	Liver of Calf 560	2626	340	220	September 23, 1907	Died 49 days	Intraperitoneal	Sub-acute disease resembling that in Guinea-pig 2589.
"	Liver of Calf 560	2628	430	260	September 23, 1907	Died 58 days	Intraperitoneal	Resembled Guinea-pig 2589.
"	Liver of Calf 558	2868	590	410	October 31, 1907	Died 58 days	Intraperitoneal	Omentum contained five soft yellow nodules. Spleen small. Gritty irregular foci in liver. (No T.B.) Opaque foci in a lumbar and a mediastinal gland.
"	Portal gland of Calf 558.	2869	350	270	October 31, 1907	Died 127 days	Intraperitoneal	A focus in the muscle and a nodule in the omentum.

"	Bronchial gland of Calf 558.	**2871**	180	140	October 31, 1907	Died 37 days	Intraperitoneal	Resembled Guinea-pig 2589.
"	Liver of Calf 564	**2900**	170	190	November 7, 1907	Died 55 days	Intraperitoneal	Resembled Guinea-pig 2589.
"	Mediastinal gland of Calf 564.	**2901**	190	250	November 7, 1907	Died 119 days	Intraperitoneal	Three yellow tubercles in omentum. Purulent nodule in a ventral mediastinal gland.
"	Spleen of Guinea-pig 2626.	**2905**	380	220	November 11, 1907	Died 143 days	Intraperitoneal	Six pea-sized purulent nodules in the omentum and one on the peritoneum.
"	Local lesion of Monkey 192.	**3009**	320	180	February 3, 1908	Died 16 days	Intraperitoneal	Omentum a little thickened. Lumbar and mediastinal glands slightly enlarged. (Numerous T.B.)
"	Local lesion of Monkey 194.	**3011**	280	210	February 3, 1908	Died 31 days	Intraperitoneal	No tuberculosis.
"	Local lesion of Calf 572	**3172**	370	290	May 20, 1908	Died 31 days	Intraperitoneal	Sub-acute tuberculous disease of usual (avian) type.
"	Prescapular gland of Calf 572.	**3174**	410	600	May 20, 1908	Killed 105 days	Intraperitoneal	Caseo-purulent nodules in omentum.
"	Prescapular gland of Calf 572.	**3177**	450	640	May 20, 1908	Killed 105 days	Intraperitoneal	Caseo-purulent nodules on the peritoneum and omentum.
"	Prescapular gland of Calf 576.	**3179**	400	720	May 20, 1908	Killed 105 days	Intraperitoneal	Two caseo-purulent nodules on parietal peritoneum. One on the liver, and one in the omentum.
"	Inferior cervical gland of Calf 576.	**3182**	380	570	May 20, 1908	Killed 105 days	Intraperitoneal	Caseo-purulent nodule the size of a hemp seed in omentum.
"	Mesenteric gland of Calf 576.	**3180**	400	600	May 20, 1908	Killed 105 days	Intraperitoneal	Animal healthy.
"	Prescapular gland of Goat 50.	**3311**	490	650	August 6, 1908	Killed 60 days	Intraperitoneal	Two miliary tubercles in omentum, and one on the liver.
"	Prescapular gland of Goat 50.	**3313**	500	670	August 6, 1908	Killed 60 days	Intraperitoneal	Three grey tubercles with opaque centres in omentum.
"	Lung of Calf 548	**2560**	420	540	July 9, 1907	Killed 188 days	Subcutaneous	Purulent focus in inguinal glands only.
"	Lung of Calf 548	**2561**	280	570	July 9, 1907	Killed 188 days	Subcutaneous	Purulent local lesion and nodules in the inguinal glands.
"	Spleen of Calf 548	**2558**	460	630	July 9, 1907	Killed 188 days	Subcutaneous	Scar in the skin. Soft caseous nodules in the inguinal glands.
"	Spleen of Calf 548	**2559**	320	670	July 9, 1907	Killed 188 days	Subcutaneous	Resembled Guinea-pig 2560.
"	Liver of Calf 554	**2590**	300	520	August 13, 1907	Killed 154 days	Subcutaneous	Purulent nodule in inguinal gland only.
"	Spleen of Calf 550	**2593**	370	430	August 14, 1907	Killed 153 days	Subcutaneous	Purulent nodules in inguinal glands.
"	Liver of Calf 560	**2627**	370	530	September 23, 1907.	Killed 169 days	Subcutaneous	Purulent foci under the skin and in the inguinal glands.
"	Liver of Calf 558	**2867**	520	280	October 31, 1907	Died 151 days	Subcutaneous	Purulent nodules in an inguinal gland.
"	Portal gland of Calf 558.	**2870**	150	170	October 31, 1907	Died 62 days	Subcutaneous	Purulent local lesion only.
"	Liver of Calf 564	**2898**	200	290	November 7, 1907.	Died 122 days	Subcutaneous	Purulent nodules in the subcutaneous tissue and the nearest glands.
"	Liver of Calf 564	**2899**	200	300	November 7, 1907.	Died 118 days	Subcutaneous	Similar to the above.
"	Lung of Calf 570	**2946**	370	280	December 9, 1907	Died 149 days	Subcutaneous	Caseo-purulent nodules in an inguinal gland. A few opaque foci in a sternal gland.

INOCULATION EXPERIMENTS ON GUINEA-PIGS WITH EMULSIONS OF TUBERCULOUS MATERIAL (AVIAN)—*continued.*

Virus.	Material used.	Number.	Weight in Grammes.		Date of Inoculation.	Duration of Life.	Method of Inoculation.	Result.
			Initial.	Final.				
A. X.	Spleen of Calf 570	2947	360	300	December 9, 1907	Died 101 days	Subcutaneous	Ulcer in skin. Purulent nodules in an inguinal gland
,,	Liver of Calf 570	2944	330	390	December 9, 1907	Died 28 days	Subcutaneous	Local tumour composed of grey tissue with yellow foci. Sternal gland slightly enlarged. (T.B.)
,,	Liver of Calf 570	2945	370	290	December 9, 1907	Died 136 days	Subcutaneous	Caseo-purulent local lesion. Foci in the inguinal and sternal glands.
,,	Liver of Calf 566	2952	430	330	December 13, 1907	Died 110 days	Subcutaneous	No tuberculosis.
,,	Mesenteric gland of Calf 566.	2953	300	350	December 13, 1907	Killed 153 days	Subcutaneous	Small purulent nodule in each inguinal gland.
,,	Local lesion of Monkey 192.	3010	310	260	February 3, 1907	Died 31 days	Subcutaneous	Soft caseous nodule in subcutaneous tissue. Soft yellow nodule in each inguinal gland.
,,	Local lesion of Monkey 194.	3012	230	220	February 3, 1907	Died 59 days	Subcutaneous	Caseo-purulent local lesion. Inguinal glands cystic and purulent.
,,	Lung of Pig 236	3148	560	320	April 13, 1908	Died 45 days	Subcutaneous	Ulcer in skin. Soft yellow nodules in the inguinal glands.
,,	Liver of Pig 236	3149	560	340	April 13, 1908	Died 42 days	Subcutaneous	Similar to above.
,,	Mesenteric gland of Pig 236.	3150	560	650	April 13, 1908	Killed 138 days	Subcutaneous	Caseous streaks in subcutaneous tissue. Caseo-purulent nodules in inguinal glands. Two soft yellow foci in right bronchial gland.
,,	Rectal gland of Pig 236.	3151	520	350	April 13, 1908	Died 47 days	Subcutaneous	Similar to Guinea-pig 3148. There were also three grey foci in the spleen. (T.B.)
,,	Prescapular gland of Calf 572.	3173	400	590	May 20, 1908	Killed 105 days	Subcutaneous	Small ulcer in skin. Caseo-purulent cyst in subcutaneous tissue and one in the inguinal gland.
,,	Prescapular gland of Calf 572.	3175	400	550	May 20, 1908	Killed 105 days	Subcutaneous	Caseo-purulent nodule in abdominal muscle and inguinal gland.
,,	Prescapular gland of Calf 572.	3176	400	600	May 20, 1908	Killed 105 days	Subcutaneous	Caseo-purulent nodules in subcutaneous tissue and inguinal gland.
,,	Prescapular gland of Calf 576.	3178	350	570	May 20, 1908	Killed 105 days	Subcutaneous	No local lesion. Small caseo-purulent nodules in both inguinal glands.
,,	Inferior cervical gland of Calf 576.	3181	450	520	May 20, 1908	Killed 105 days	Subcutaneous	Small scar and two tubercles in the skin. Caseo-purulent nodule in right inguinal gland.
,,	Prescapular gland of Goat 50.	3312	470	700	August 6, 1908	Killed 60 days	Subcutaneous	No tuberculosis.
P. II.	Original material (Submaxillary gland of a pig).	1461	280	330	March 10, 1905	Killed 31 days	Intraperitoneal	Caseo-purulent nodules in the omentum. Spleen enlarged. Pyloric lumbar and sternal glands contained purulent foci.
,,	Omentum of Guinea-pig 1461.	1500	310	400	April 10, 1905	Killed 35 days	Intraperitoneal	Omentum contained caseo-purulent cysts ; a few nodules on the peritoneum. Animal otherwise healthy.
,,	Omentum of Guinea-pig 1500.	1539	270	200	May 15, 1905	Died 61 days	Intraperitoneal	Omentum contained two caseo-purulent nodules. No disease elsewhere.
,,	Mesenteric gland of Pig 110.	1860	400	230	January 18, 1906	Killed 41 days	Intraperitoneal	Caseo-purulent gritty nodules in omentum and on peritoneum. Purulent foci in inguinal and bronchial glands.

,,	Inguinal gland of Guinea-pig 1859.	1919	320	310	February 28, 1906	Killed 71 days	Intraperitoneal	No tuberculosis.
,,	Bronchial gland of Guinea-pig 1860.	1920	320	—	February 28, 1906	Died 38 days	Intraperitoneal	Opaque focus in a lumbar gland (T.B.). No disease elsewhere.
,,	Inguinal gland of Pig 106.	1856	260	220	January 15, 1906	Killed 45 days	Subcutaneous	Purulent local lesion and foci in inguinal glands.
,,	Mesenteric gland of Pig 110.	1859	250	180	January 18, 1906	Killed 41 days	Subcutaneous	Small ulcer. Purulent subcutaneous nodule. Foci in the axillary glands.
P. III.	Original material (Submaxillary gland of a pig).	1462	290	440	March 10, 1905	Killed 33 days	Intraperitoneal	There were visible only a few opaque foci in the omental, pyloric and coeliac glands.
,,	Spleen of Calf 282.	1613	310	370	July 4, 1905	Died 133 days	Intraperitoneal	Caseo-purulent nodules in the omentum.
,,	Mesenteric gland of Pig 112.	1691	640	420	September 14, 1905	Died 17 days	Intraperitoneal	Acute tuberculosis of usual (avian) type.
,,	Prescapular gland of Calf 318.	1798	320	190	December 11, 1905	Died 43 days	Intraperitoneal	No tuberculosis.
,,	Spleen of Calf 318.	1795	430	240	December 11, 1905	Died 23 days	Intraperitoneal	No tuberculosis.
,,	Lung of Pony 14.	3202	470	700	June 15, 1908	Killed 100 days	Intraperitoneal	Animal healthy.
,,	Liver of Pony 14.	3200	320	250	June 15, 1908	Died 10 days	Intraperitoneal	Omentum slightly thickened and adherent. Spleen a little enlarged. Pleural cavities filled with fluid. Lungs oedematous. Smear from liver showed no T.B., from the lung a few T.B.
P. III.	Liver of Pony 14.	3201	300	610	June 15, 1908	Killed 100 days	Intraperitoneal	Animal healthy.
,,	Colic gland of Pony 14.	3203	320	710	June 15, 1908	Killed 100 days	Intraperitoneal	Two purulent miliary nodules in subcutaneous tissue. Two hempseed-sized caseo-purulent nodules in omentum.
,,	Mesenteric gland of Calf 318.	1796	290	150	December 11, 1905	Died 20 days	Subcutaneous	No tuberculosis.
,,	Prescapular gland of Calf 318.	1797	460	280	December 11, 1905	Died 43 days	Subcutaneous	Caseo-pus in subcutaneous tissue and inguinal gland.
P. XXI.	Original material (Submaxillary gland of a pig).	1798	310	190	December 5, 1905	Killed 41 days	Intraperitoneal	A single tubercle in the omentum.
,,	Lung of Calf 412	2161	620	550	August 30, 1906	Killed 64 days	Intraperitoneal	Animal healthy.
,,	Lung of Calf 412	2162	470	520	August 30, 1906	Killed 57 days	Intraperitoneal	Ditto.
,,	Mesenteric gland of Calf 412.	2163	900	780	August 30, 1906	Killed 64 days	Intraperitoneal	Ditto.
,,	Lung of Rabbit 878	2175	450	580	October 25, 1906	Killed 83 days	Intraperitoneal	(Opaque focus in a rib.) Culture was avian in type.
,,	Liver of Rabbit 878	2174	400	550	October 25, 1906	Killed 83 days	Intraperitoneal	A single tubercle in the omentum.
,,	Kidney of Rabbit 878	2173	500	600	October 25, 1906	Killed 83 days	Intraperitoneal	Animal healthy.
,,	Lung of Rabbit 1164	2409	570	420	March 30, 1907	Died 43 days	Intraperitoneal	Caseo-purulent nodules in omentum and portal glands.
,,	Lung of Rabbit 1164	2411	580	390	March 30, 1907	Died 39 days	Intraperitoneal	Grey nodules with soft centres in omentum. Opaque foci in pyloric, lumbar, portal, manubrial, and mesenteric glands. Translucent foci in liver and lungs.

INOCULATION EXPERIMENTS ON GUINEA-PIGS WITH EMULSIONS OF TUBERCULOUS MATERIAL (AVIAN)—*continued.*

Virus.	Material used.	Number.	Weight in Grammes.		Date of Inoculation.	Duration of Life.	Method of Inoculation.	Result.
			Initial.	Final.				
P. XXI.	Lung of Rabbit 1329	2606	420	490	August 31, 1907	Killed 341 days	Intraperitoneal	In each lung there was a softening yellow miliary tubercle. Opaque focus in a bronchial gland. No disease elsewhere. Culture from each tubercle avian in type.
"	Lung of Guinea-pig 2606.	3315	250	400	August 7, 1908	Killed 91 days	Intraperitoneal	Caseo-purulent nodules in omentum, on diaphragm and liver.
"	Lung of Guinea-pig 2606.	3314	250	400	August 7, 1908	Killed 91 days	Subcutaneous	No tuberculosis.
P. XXVII.	Spleen of Calf 390	2041	360	470	May 23, 1906	Killed 65 days	Intraperitoneal	Caseo-purulent nodule in omentum.
"	Suprarenal of Calf 390	2044	450	340	May 23, 1906	Killed 65 days	Intraperitoneal	Purulent nodule in omentum.
"	Prepectoral gland of Calf 390.	2046	540	420	May 23, 1906	Killed 65 days	Intraperitoneal	Animal healthy.
"	Portal gland of Calf 390.	2045	550	590	May 23, 1906	Killed 65 days	Intraperitoneal	Animal healthy.
"	Local lesion of Calf 492	2536	1,050	850	June 28, 1907	Killed 150 days	Intraperitoneal	Caseo-purulent nodules in subcutaneous tissue and omentum.
"	Local lesion of Calf 492	2537	950	870	June 28, 1907	Killed 150 days	Intraperitoneal	Similar to above.
"	Local lesion of Calf 492	2538	970	890	June 28, 1907	Killed 150 days	Subcutaneous	Caseo-purulent local lesion only.
P. XXVII.	Original material (Submaxillary gland of a pig).	1799	260	210	December 12, 1907	Killed 30 days	Subcutaneous	Purulent local lesion and foci in the inguinal glands.
P. XLIV.	Original material (Submaxillary gland of a pig).	2119	520	560	June 29, 1906	Killed 40 days	Intraperitoneal	Animal healthy.
"	Local lesion of Calf 490	2472	750	960	May 6, 1907	Killed 75 days	Intraperitoneal	Four caseo-purulent nodules in omentum and on diaphragm.
"	Prescapular gland of Calf 490	2470	750	560	May 6, 1907	Died 9 days	Intraperitoneal	No tuberculosis.
"	Mesenteric gland of Calf 490	2473	700	810	May 6, 1907	Killed 75 days	Intraperitoneal	Opaque focus in a bronchial gland only.
"	Mesenteric gland of Calf 490.	2474	500	530	May 6, 1907	Killed 102 days	Intraperitoneal	Three tubercles in omentum only.
"	Local lesion of Calf 490	2471	700	930	May 6, 1907	Killed 102 days	Subcutaneous	Caseo-purulent local lesion only.
"	Prescapular gland of Calf 490.	2469	520	490	May 6, 1907	Died 58 days	Subcutaneous	No tuberculosis.

TABULAR SUMMARY OF INOCULATION EXPERIMENTS ON RATS WITH AVIAN TUBERCLE BACILLI.

Virus.	Source of Culture.	No. of Rat.	Age and Generation of Subculture.	Dose.	Date of Inoculation.	Duration of Life.		Result.
						Intrap.	Subcut.	
P. II.	Original material.	84	11th generation, 23 days old.	10·0 mg.	Sept. 25, 1905	—	13 days (died).	At the seat of inoculation in the subcutaneous tissues was an irregular hard mass the size of a broad bean; the skin was adherent, and on the point of breaking down; on section the mass was tough, and showed translucent tissue with a pale whitish mottling. The inguinal, axillary and iliac glands were enlarged and firm, but not opaque. The mesenteric glands appeared a little enlarged. Other glands and all organs appeared normal. Microscopical.—Very numerous T.B. in inguinal, axillary and iliac glands; a moderate number in the spleen; a few in the kidney; none seen in the lung.
,,	,,	85	,,	10·0 mg.	,,	—	184 days (died). Inoculation partly intraperitoneal.	In the abdominal wall was a small ulcer, and under the skin at one margin a small fibro-caseous mass. An inguinal gland on either side showed a yellowish patchy appearance in the cortex; in the axillary glands were some yellow caseous streaks. The omentum was not thickened, and contained a number of tubercles up to a shot in size; the larger had fibrous walls and soft gritty contents. Peritoneum normal. Spleen enlarged, firm, and dark red; no tubercles seen. Two small tubercles were seen in the liver. On the surface of the right kidney was a yellow focus extending as a wedge into the cortex, and a few whitish foci in the medulla. The substance of the right suprarenal was replaced by two soft greyish yellow nodules. The lungs were a little congested, but otherwise normal. All other organs and glands appeared normal. Microscopical.—Swarms of T.B., resembling a pure culture, in the suprarenal; numerous T.B. in the kidney, omentum, inguinal gland, and spleen.
P. III.	Original material.	78	10th generation, 21 days old.	1·0 mg.	Sept. 7, 1905	—	183 days (died).	There was a small local ulcer leading into a sinus in the left inguinal region, which contained a few caseous flakes. The inguinal glands were not obviously enlarged. In the lungs were two small collapsed areas. All other organs and glands were normal. Microscopical.—Local lesion and inguinal gland, T.B. numerous. A group of seven T.B. was seen in a smear from the collapsed area of lung. Spleen, a few T.B.; liver and kidney, no T.B. seen.
,,	,,	79	,,	1·0 mg.	,,	219 days (died).	—	In the omentum was a pea-sized soft caseous nodule, and in the mesentery a similar smaller nodule. Firmly adherent to the stomach was a flattened caseous nodule, together with several smaller ones, attaching the stomach to the liver. In the liver was a caseous nodule, which had probably been pressed in from the outside. All other organs and glands appeared normal. Microscopical.—Mesenteric nodule, stomach nodule, spleen, liver, and mediastinal gland contained very numerous T.B.; in the lungs they were seen in moderate numbers.
,,	,,	80	,,	5·0 mg.	,,	—	167 days (died).	No lesion was seen in the subcutaneous tissues. The omentum, peritoneum, liver, spleen, and kidneys were normal. The lungs, bronchial glands, and neck structures had been eaten. Microscopical.—Spleen, T.B. in moderate numbers; liver, a few T.B.; kidney, no T.B. seen.
,,	,,	81	,,	5·0 mg.	,,	—	111 days (died).	In the left inguinal region beneath the skin was a pea-sized tumour filled with soft yellow caseous substance. The inguinal glands were small and normal. On the large intestine in the pelvis was a small mass similar to the above. All other structures had been eaten. Microscopical.—Subcutaneous tumour; a mass of bacilli were seen, together with very numerous granules more deeply stained. Nodule from the large intestine, T.B. very numerous.

TABULAR SUMMARY OF INOCULATION EXPERIMENTS ON RATS WITH AVIAN TUBERCLE BACILLI—*continued.*

Virus.	Source of Culture.	No. of Rat.	Age and Generation of Subculture.	Dose.	Date of Inoculation.	Duration of Life.		Result.
						Intrap.	Subcut.	
P. XXI.	Original material.	105	11th generation, 22 days old.	1·0 mg.	Nov. 22, 1906	109 days (killed).	—	The omentum contained moderately numerous discrete firm greyish white tubercles up to a millet seed in size, without central softening. In the small omentum was a grey nodule with caseous contents. The lungs were pink and crepitant, but were a little congested anteriorly. Other organs and glands were normal. Microscopical.—Firm omental nodule, liver and spleen T.B. numerous; lungs, a few T.B.; kidney, no T.B. seen.
"	Original material.	106	11th generation, 22 days old.	1·0 mg.	Nov. 22, 1906.	—	109 days (killed).	In the skin of the abdomen there was a minute ulcer. The lungs were a little congested. All other organs and glands appeared normal. Microscopical.—Smears from the liver, spleen, and kidney showed no T.B. A smear from the lung showed one T.B.
"	"	107	"	10·0 mg.	"	—	109 days (killed).	In the skin of the abdomen there was a small perfectly clean linear ulcer. The lungs collapsed well: one was a little congested. All other organs and glands appeared normal. Microscopical.—No T.B. were seen in smears from the lung, liver, spleen, or kidney.
A. I.	Original material.	102	8th generation, 22 days old.	1·0 mg.	"	109 days (killed).	—	The omentum was retracted, and contained in the free margin two pea-sized nodules, with grey capsules and caseo purulent contents, and also a moderate number of firm greyish-white tubercles up to a rape seed in size. The spleen was slightly enlarged and was firm. The lungs collapsed well, and were a little oedematous; the mediastinal glands were a trifle enlarged. Other organs and glands appeared normal. Microscopical.—Omentum, T.B. very numerous; spleen, T.B. in moderate numbers; lung, two T.B. seen; kidney, no T.B. seen.
"	"	103	"	1·0 mg.	"	—	109 days (killed).	There was no local lesion visible. The lungs collapsed well, and showed some dark patches of congestion. The mediastinal glands were much smaller than in No. 102. Other organs and glands appeared normal. Microscopical.—No T.B. were seen in smears from the liver, spleen, kidney, lung, or inguinal gland.
"	"	104	"	10·0 mg.	"	—	109 days (killed).	There was no local lesion visible; the inguinal glands were perhaps a little enlarged. The lungs collapsed, but were a little congested and oedematous. Other organs and glands appeared normal. Microscopical.—Spleen, 2 T.B. seen; liver, lung, kidney, no T.B. seen.
A. II.	Original material.	119	9th generation, 20 days old.	10·0 mg.	March 1, 1907	188 days (killed).	—	Omentum was retracted and contained several grey nodules with soft caseous centres up to 1 cm. in diameter. Similar nodules on peritoneum, diaphragm, spleen and liver. Spleen enlarged and firm. Malpighian bodies prominent. Lungs and liver normal. Small pits in the kidney surfaces. Testis replaced by softening caseous mass. Microscopical.—Smears from the spleen and testis showed numerous T.B., from the liver and lung a few, and from the kidney none.

,,	,,	120	,,	50·0 mg.	,,	247 days (died).	—	In the omentum there were fibroid tubercles with caseous centres up to a pea. Spleen enlarged and dark red. A few grey points in the liver. Surfaces of kidneys pitted and in each there was a caseous nodule extending to the pelvis which contained soft caseous substance. Lungs congested. Testes caseous. Microscopical.—Smears showed numerous tubercle bacilli in the spleen, liver, kidney, and lung; none in the blood.
,,	,,	121	,,	50·0 mg.	,,	164 days (died).	—	Body almost eaten. Lungs dark, congested, and oedematous; at the caudal extremity of one lung there was a caseous nodule. Similar nodules on the pleura. Manubrial, sternal, and posterior mediastinal glands enlarged and composed of soft caseous substance. Microscopical.—Smear from manubrial gland showed swarms of tubercle bacilli; from the lung a moderate number.
,,	,,	122	,,	100·0 mg.	,,	—	255 days (killed).	There was no local lesion visible. All organs and glands appeared healthy. Microscopical.—Smear from the spleen showed moderately numerous T.B., from the axillary gland numerous T.B. No T.B. could be demonstrated in liver, lung, or kidney. A culture was grown from the spleen.
A. III.	Original material.	108	4th generation, 22 days old.	50·0 mg.	Feb. 6, 1907.	24 days (died).	—	The omentum was retracted and contained a few grey tubercles along the free margin. The spleen was enlarged and firm. The liver substance was pale. The lungs collapsed partially, were oedematous and deeply congested. The mediastinal glands were enlarged and congested. Four sternal glands at the junction of the costal cartilages were slightly enlarged, soft, and yellow. Microscopical.—Spleen, T.B. very numerous; liver and sternal gland, T.B. numerous; lungs and kidney, a few T.B. seen.
,,	,,	109	,,	10·0 mg.	,,	285 days (died).	—	The omentum contained forty fibrous miliary tubercles with opaque centres. Spleen firm and about double the normal size. Liver normal. A few yellowish foci in the kidneys. Lungs pinkish and a little oedematous; the left was adherent to parietes. Ventral mediastinal glands enlarged and congested. Microscopical.—Smears showed numerous tubercle bacilli in the spleen, liver, and mediastinal gland; a few in the lung and kidney.
,,	,,	110	,,	10·0 mg.	,,	20 days (died).	—	On the mesentery and on part of the small intestine were a few opaque white foci. The spleen was greatly enlarged (5·0 by 0·8 cm.), it was greenish externally but pink on section. The liver contained a small necrotic patch in the margin from which a smear was made, and also two yellow calcareous grains. The kidneys were dark in colour. The lumbar glands were a little enlarged and firm. There was some fluid in the peritoneal cavity. The lungs were slightly congested, and the mediastinal glands a little enlarged. Microscopical.—Spleen and mediastinal gland, T.B. numerous; liver, T.B. in moderate numbers; lung, a few T.B.; kidney, 3 T.B. seen.
,,	,,	111	,,	1·0 mg.	,,	376 days (died).	—	In the omentum there was a nodule 2 by 1 cm. of soft yellow substance in a fibrous capsule and yellow miliary tubercles with thin fibrous capsules and calcareous centres. Spleen a little enlarged. Liver and kidneys normal. Lungs congested, oedematous, and emphysematous. Microscopical.—Smears from spleen and lung showed a few T.B.; kidney none.
,,	,,	112	,,	50·0 mg.	,,	—	8 days (died).	Small purulent nodule surrounded by fibrous thickening in the subcutaneous tissue. Organs and glands normal. Microscopical.—Smears showed moderately numerous T.B. in the spleen, a few in the liver, and none in the lung, kidney, and blood.

TABULAR SUMMARY OF INOCULATION EXPERIMENTS ON RATS WITH AVIAN TUBERCLE BACILLI—*continued.*

Virus.	Source of Culture.	No. of Rat.	Age and Generation of Subculture.	Dose.	Date of Inoculation.	Duration of Life.		Result.
						Intrap.	Subcut.	
A. III.	Original material.	113	4th generation, 22 days old.	10·0 mg.	Feb. 6, 1907.	—	18 days (died).	At the seat of inoculation in the subcutaneous tissues was a greyish-white fibrous thickening about 1 cm. in length, containing a little soft purulent substance. The axillary glands did not appear enlarged. All other glands and organs appeared normal. Microscopical.—Spleen, T.B. in moderate numbers; liver, 6 T.B. seen; blood, lungs, kidney, no T.B. seen.
"	"	114	"	10·0 mg.	"	—	290 days (died).	Small scar in the skin of the back and three greyish white nodules in the subcutaneous tissue. Organs and lymphatic glands normal. Microscopical.—Smears showed a moderate number of T.B. in an axillary gland, a few in the liver, spleen, and lung, and none in the kidney.
"	"	115	"	1·0 mg.	"	—	278 days (killed).	No local lesion visible. Organs and glands normal. Microscopical.—Smears showed numerous T.B. in an axillary gland, a few in the spleen and lung, none in the liver and kidney. A culture was grown direct from the spleen.
A. VII.	Original material.	123	4th generation, 21 days old.	0·01 mg.	Mar. 12, 1907	574 days (killed).	—	Animal apparently in good health. In the small omentum there were a few yellowish gritty granules. At the caudal extremity of the right lung there was a large pea-sized nodule composed of soft grey translucent tissue. Spleen, liver, and kidneys apparently normal. There were a few tubercle bacilli in smears from the omental granules and spleen, none in the liver, kidney, and lung nodule. Cultures were grown from spleen and liver.
"	"	124	"	0·1 mg.	"	173 days (died).	—	Omentum, peritoneum, liver, spleen, and kidneys were normal in appearance. Lungs a little congested. Microscopical.—Smears showed a few T.B. in the liver and spleen and (?) 1 in a kidney.
"	"	125	"	1·0 mg.	"	177 days (killed).	—	Omentum slightly thickened along the free margin contained fairly numerous hard greyish white nodules up to a hemp seed. A few similar nodules on the meso-colon and peritoneum. Spleen a little enlarged. Liver and kidneys normal. Lungs showed a few light grey patches on the surface and a single grey nodule. Ventral mediastinal glands enlarged and congested. Microscopical.—Smear showed numerous T.B. in the spleen, omentum, mediastinal gland and lung nodule, a few in the liver and no T.B. in the kidney.
"	"	127	"	20·0 mg.	"	82 days (killed).	—	The omentum contained moderately numerous fibrous nodules with soft caseous centres up to a hemp-seed; they were arranged on each side of the vessels. Spleen was large and firm, measuring 5·7 by 1·2 cm.; the pulp showed innumerable grey points. Liver pale. Kidneys normal. Lungs collapsed well, but showed on the surface dark reddish grey areas. Lumbar mediastinal (ventral) and bronchial glands contained caseo-purulent nodules. Microscopical.—Smears showed very numerous T.B. in the omentum, liver, spleen, and lumbar gland; numerous T.B. in the kidney and lung.
"	"	128	"	20·0 mg.	"	—	244 days (killed).	No sign of a local lesion. Organs and glands normal. Microscopical.—Smears showed a few T.B. in the spleen, no T.B. in the liver, kidney, and lung.

A. VIII.	Original material.	132	4th generation. 21 days old.	200·0 mg.	May 28, 1907	131 days (died).	—	Omentum retracted contained discrete soft caseous nodules. Numerous softening caseous nodules on the diaphragm up to 1·5 by 7 cm. Similar nodules on the stomach, mesentery, intestines, kidneys, and parietal peritoneum. Masses of nodules in the lumbar and iliac regions, and on the spermatic cords. Testes partly replaced by caseous substance. Spleen enlarged and peppered with grey points. Liver normal. Numerous yellowish grey foci in the kidneys. Lungs showed dark red congested areas. Sternal and mediastinal glands enlarged and caseous. The majority of the caseous nodules contained gritty foci. Smears from the liver, spleen, and mediastinal glands showed numerous T.B., moderately numerous in the lung, and a few in the kidney.
"	"	133	"	1·0 mg	"	497 days (killed).	—	In the omentum there were from 20 to 30 hard yellowish white nodules from a rape seed up to a hemp seed in size; they consisted of calcareous centres which shelled out leaving thin fibrous capsules; there were also two cysts filled with yellow soft caseous gritty substance. The right epididymis and both vesiculae seminales were enlarged to the size of a robin's egg and filled with soft caseous substance. The spleen was enlarged, firm, and red. The surfaces of the kidneys showed minute pits. The lungs were congested and oedematous. No disease elsewhere. Smear preparations showed a few T.B. in the spleen, liver, and kidney, none in the lung, and very numerous in the omental nodule. Cultures were grown from spleen and omentum.
A. X.	Original material.	134	4th generation, 21 days old.	100·0 mg.	May 30, 1907	12 days (died).	—	Omentum contained grey miliary nodules arranged along the vessels. Spleen enlarged. Liver and kidneys normal. Lungs congested and collapsed: pleural cavities filled with fluid. Lumbar, ventral mediastinal and sternal glands showed caseous patches. Microscopical.—Smears showed very numerous T.B. in the spleen, liver, sternal gland, and omentum, moderately numerous T.B. in the lung and kidney.

FEEDING EXPERIMENTS ON RATS WITH AVIAN TUBERCLE BACILLI.

Virus.	Material Used.	No. of Rat.	Date of Inoculation.	Duration of Life.	Result.
A. III.	Organs of G.P. 2369.	116	February 19, 1907	Died 113 days	Organs and glands appeared normal. Smear preparations from the liver, lung, spleen, kidney, and mesenteric glands showed no tubercle bacilli.
"	"	117	"	Killed 198 days	Organs and glands healthy. Smear preparations showed a moderate number of tubercle bacilli in a mesenteric gland, a few in the spleen and in a kidney, and none in the liver or lung.
"	"	118	"	Killed 265 days	All organs and glands appeared healthy and no tubercle bacilli could be seen in smear preparations from the principal organs and a mesenteric gland.
A. VIII.	Organs of Rabbit 1353.	136	June 19, 1907	Died 152 days	All organs and glands appeared normal and no tubercle bacilli could be seen in smear preparations from the principal organs and a mesenteric gland.

INOCULATION EXPERIMENTS ON DOGS WITH AVIAN TUBERCLE BACILLI.

Virus.	Strain.	Number of Dog.	Weight in Grammes.		Date of Inoculation.	Age and Generation of Subculture Inoculated.	Dose.	Method of Inoculation.	Duration of Life.	Result.
			Initial.	Final.						
P. III.	Original material (Submaxillary gland of a pig).	122	—	—	April 12, 1906	15 days old, 18th generation.	25·0 mg.	Sub-cutaneous.	Killed 74 days.	The carcass was emaciated; the dog had lost power in its hind legs, but the post-mortem examination showed nothing to account for this condition. At the seat of inoculation there was a fibrous walled flat cavity filled with clear fluid, communicating externally through a minute puncture in the skin. The left inguinal and iliac glands were slightly enlarged. The liver contained scattered grey points (smear, tubercle bacilli in moderate number). There were two small tubercles in the lung (smear, a few tubercle bacilli). There was no tuberculosis elsewhere.
P. XXI.	Original material (Submaxillary gland of a pig).	124	—	—	April 12, 1906	19 days old, 5th generation.	25·0 mg.	Sub-cutaneous.	Died 33 days.	At the seat of inoculation there was a patch the size of a shilling composed of grey granulation tissue infiltrated with soft yellow streaks. The adjacent glands were normal. The bronchial glands were a little enlarged: a smear showed fairly numerous tubercle bacilli. There were patches of broncho-pneumonia (no tubercle bacilli in three films examined) in the lungs.
A. VIII.	Original material (Spleen of a fowl).	154	3,530	10,400	May 28, 1907	21 days old, 4th generation.	10·0 mg.	Intravenous	Killed 171 days.	All organs and glands were normal.
A. VIII.	Original material (Spleen of a fowl).	152	3,200	—	May 28, 1907	21 days old, 4th generation.	1·0 mg.	Intravenous	Killed 194 days.	All organs and glands were normal.
A. X.	Original material.	162	4,850	9,400	July 9, 1907	21 days old, 5th generation.	50·0 mg.	Intravenous	Killed 146 days.	In the lung there were two translucent foci of doubtful nature. In one kidney two small grey nodules with opaque centres were seen. No tubercle bacilli were seen in smears made from the substance of the lung, liver, and spleen.
A. X.	Original material.	164	10,270	—	July 9, 1907	21 days old, 5th generation.	50·0 mg.	Intravenous	Killed 142 days.	All organs and glands were free from tuberculous lesions. Cultures were sown from the liver, kidneys, and spleen substance; in each case colonies of avian tubercle bacilli developed.

DESCRIPTIVE TABLES GIVING ALL THE ANIMALS INOCULATED WITH EACH VIRUS, AND THE DETAILED RESULTS OF THE POST-MORTEM EXAMINATIONS OF CALVES, MONKEYS, GOATS, CHIMPANZEE, DOGS, CATS, PIGS, PONIES.

VIRUS A I. (Intestine of a Touracou).

CULTURE INOCULATIONS.

I.—April 26, 1906.

The strain was derived from the original material and had been in cultivation a total period of 70 days.

The culture used was the 4th generation, 21 days old.

CALF 402.

Subcutaneous.

Dose : 100·0 mg.

Killed : July 27, 1906.

92 days.

P.M. — Small caseo-fibrous local tumour. The prescapular gland was largely composed of caseous material set in brownish translucent tissue. A left prepectoral and a left cervical gland were largely caseo-calcareous. There was no tuberculosis elsewhere.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
834	Intrav.	1·0 mg.	D. 16 days	Acute T
835	Intrap.	1·0 mg.	D. 25 ,,	G. T.
833	Fed	10·0 mg.	K. 161 ,,	S T.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
1974	Subcut.	1·0 mg.	K. 229 days	Slight T.
1975	Intrap.	1·0 mg.	K. 229 ,,	Local T.

VIRUS A I. (Intestine of a Touracou)—*continued.*

CULTURE INOCULATIONS—*continued.*

II.—November 22, 1906.

The strain was derived from the original material and had been in artificial cultivation a total period of 279 days.

The culture used was the 8th generation, 20 days old.

MONKEY 158.

Intravenous, and partly subcutaneous.

Dose: slightly more than 1·0 mg.

Died: January 24, 1907. 63 days.

P.M.—Death was evidently due to exposure to severe cold. Several small caseo-purulent nodules were seen at the seat of inoculation. There was no disease elsewhere.

MONKEY 160.

Intravenous.

Dose: Slightly more than 10·0 mg.

Died: December 11, 1906. 19 days.

P.M.—The monkey died after a very cold night. No definite tuberculous lesions were seen, but tubercle bacilli were found in the spleen, kidneys, lung, liver and mesenteric gland.

GUINEA-PIGS

(inoculated with emulsion of spleen).

Number.	Method.	Duration of Life.	Result.
2261	Subcut.	D. 49 days	Local T.
2262	Subcut.	K. 93 „	No T.

MONKEY 162.

Fed on three occasions with 50·0 mg. of culture.

Total amount received: 150·0 mg.

Killed: April 15, 1907.

144 days.

P.M.—No tuberculosis.

MONKEY 164.

Fed once.

Dose: 500·0 mg.

Killed: April 8, 1907.

137 days.

P.M.—No tuberculosis.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1088	Subcut.	1·0 mg.	D. 86 days	S. T.
1089	Fed	10·0 mg.	D. 179 „	S. T.
1090	Fed	1·0 mg.	D. 163 „	Chronic G. T.

RATS.

Number.	Method.	Dose.	Duration of Life.	Result.
102	Intrap.	1·0 mg.	K. 109 days	Local T. and dissemination of T.B.
103	Subcut.	1·0 mg.	K. 109 „	No T.
104	Subcut.	10·0 mg.	K. 109 „	No T.

FOWLS.

Number.	Method.	Dose.	Duration of Life.	Result.
142	Intrav. (partly sub.).	1·0 mg.	D. 137 days	G. T.
144	Subcut.	10·0 mg.	D. 47 „	G. T.
146	Fed	10·0 mg.	D. 141 „	G. T.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2218	Fed	10·0 mg.	K. 102 days	No T.
2219	Fed	30·0 mg.	K. 102 days	No T.

CALF 402. Virus A I.

Subcutaneous inoculation of culture derived from the original material.

Dose—100·0 milligrammes.

Date of Inoculation—April 26, 1906. [Age—9 days only.]

Killed when in good health—July 27, 1906. [92 days after inoculation.]

Temperature.

There was a slight rise of temperature commencing 12 days after inoculation, lasting 10 days, and reaching a maximum of 39·8° C. With this exception the temperature remained normal during the experiment.

Tuberculin Test.

July 26, 1907. [91 days after inoculation.] Bovine tuberculin. No reaction.

Weights.

	Kilos.
April 26, 1906	28·12
July 27, 1906	34·01

Total gain of weight—5·89 kilos.

POST-MORTEM EXAMINATION.

Condition.—Fair.

Local Lesion.—In the subcutaneous tissues on the left side of the neck, nearer the angle of the jaw than the shoulder, there was a firm hemispherical tumour, measuring 4 by 4 by about 2 cm., which showed on section irregular patches of yellowish white caseous material, in places broken down to form caseo-pus, surrounded and separated by translucent fibroid tissue; the skin was adherent and slightly thickened.

Left Prescapular Gland.—The left prescapular gland measured 5·8 by 3·3 by about 1·6 cm.; on section about half the substance was composed of a yellowish white friable caseous mass surrounded by an irregular zone of brownish translucent tissue closely beset with whitish calcareous particles. Extending into the centre of the caseous mass from the cortex there was a dense whitish cicatricial patch, and in the caseous material itself there was a number of small islets of brownish translucent tissue; in the normal part of the gland there was a pea-sized translucent nodule beset with caseous gritty foci.

Right Prescapular Gland.—The right prescapular gland measured 4·5 by 2 by 1 cm., and was normal on section.

Prepectoral Glands.—On the left side one, the size of a pea, was indurated, and showed around part of the periphery of the cortex a narrow whitish caseo-calcareous zone and in the rest of the substance numerous irregular calcareous particles. The prepectoral glands on the right side were normal.

Cervical Glands.—A gland near the left mastoid process was enlarged and showed rather more than a third of its substance composed of caseo-calcareous substance set in brownish translucent fibroid tissue. Other cervical glands were normal.

Thorax.

Lungs and Thoracic Lymphatic Glands.—Normal.

Heart and Pleura.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—Normal.

Liver.—Normal.

Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Tongue, Tonsils, Pharynx, and Intestines.—Normal.

Testes and Eyes.—Normal.

Various Lymphatic Glands.

The *Submaxillary, Pharyngeal, Axillary, Precrural, Lumbar, Iliac, Gastric, Mesenteric, Colic, Coeliac, Pudic, Popliteal, Gluteal, and Ischiatic Lymphatic Glands* were normal.

RHESUS MONKEY 158. Virus A I.

Intravenous Inoculation (into the vein at the bend of the right elbow) of culture derived from the original material. [NOTE.—On post-mortem examination the greater part of the dose was found to have been subcutaneous.]

Dose—Slightly more than 1·0 milligramme.

Date of Inoculation—November 22, 1906.

Died—January 24, 1907. [63 days later.]

Clinical Notes.

On the sixteenth day the wound at the seat of inoculation had healed; there was slight subcutaneous thickening, and the axillary glands were slightly enlarged.

Up to the end of December the monkey remained well; during the first week in January there was constant slight bleeding from the nose; the animal seemed fairly well, but a little depressed.

The bleeding ceased and the general health of the animal remained fairly good, but on January 24 it died of exposure to severe cold.

Temperature.

The temperature was approximately normal from the date of inoculation to January 17, after which no record of the temperature was kept.

POST-MORTEM EXAMINATION.

(The animal had been ailing slightly, and evidently died from exposure to severe cold. The carcase was in fair condition.)

Local Lesion.—At the seat of inoculation in the right arm there was some thickening around the vessel in which on section were found several small soft caseo-purulent nodules.

Axillary Glands.—The axillary glands on the right side were slightly enlarged, but showed no opacities.

Thorax.

Pleura, Lungs, Thoracic Glands, Heart.—Normal.

Abdomen.

Peritoneum, Liver, Spleen, Kidneys, Testes.—Normal.

Alimentary Tract.

Tongue, Pharynx, Tonsils, Submaxillary Glands, Intestines, Mesenteric Glands.—Normal.

Various Lymphatic Glands.

Prescapular, Cervical, Axillary, Inguinal.—Normal.

Microscopical Examination.

Local Lesion. — Tubercle bacilli moderately numerous.

Smears from { *Liver*, *Spleen*, *Kidney*, *Lung*, } No tubercle bacilli seen.

RHESUS MONKEY 160. Virus A I.

Intravenous inoculation (into the left femoral vein) of culture derived from the original material.

Dose—Slightly more than 10·0 milligrammes.

Date of Inoculation—November 22, 1906.

Died—December 11, 1906. [19 days later.]

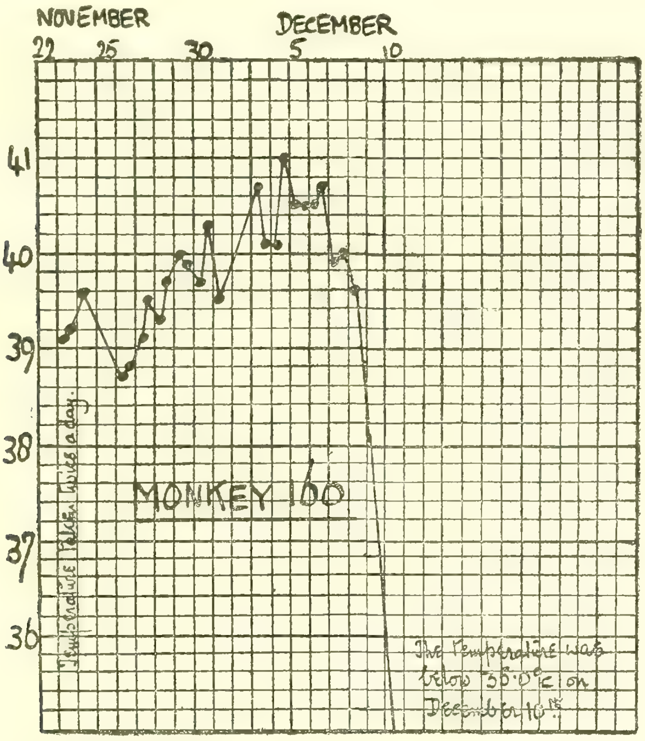
Clinical Notes.

On November 29 the monkey appeared a little thin, and not quite well; diarrhoea began three days previously but was lessening.

On December 8 the wound at the seat of inoculation had almost healed; around it was an area of bright redness. There was then no diarrhoea, and the monkey seemed to be improving in health.

On December 11 the monkey died after a very cold frosty night.

Temperature.



Tuberculin Test.—The monkey was not tested subsequent to inoculation.

POST-MORTEM EXAMINATION.

Carcass in poor condition.

Local Lesion.—The wound in the thigh at the seat of inoculation had healed without sign of suppuration.

Inguinal Glands.—Normal.

Thorax.

Lungs.—The lungs were a little oedematous, but otherwise normal.

Pleura, Heart, and Bronchial Glands.—Normal.

Abdomen.

Peritoneum.—Normal.

Liver and Kidneys.—Normal.

Spleen.—The spleen was a little firm, not obviously enlarged, and showed beneath the capsule rather indefinite grey points.

Alimentary Tract.

Tongue, Pharynx, Submaxillary and Mesenteric Glands, Intestines.—Normal.

Various Lymphatic Glands.

Prescapular, Cervical, Axillary, Lumbar, Iliac.—Normal.

Microscopical Examination.

Spleen.—Tubercle bacilli moderately numerous.

Kidney.—Tubercle bacilli scanty (two seen).

Lung.—Tubercle bacilli scanty.

Liver.— Tubercle bacilli in moderate numbers.

Mesenteric Gland.—Tubercle bacilli in moderate numbers (30 counted).

RHESUS MONKEY 162. Virus A I.

Fed on three occasions with culture derived from the original material.

Doses—
- 50·0 milligrammes on November 22, 1906.
- 50·0 milligrammes on December 5, 1906, 13 days after first feed.
- 50·0 milligrammes on January 8, 1907, 47 days after first feed.

Killed—April 15, 1907, 144 days after commencement of experiment.

Clinical Notes.

The monkey remained well and in good condition until the early part of January when it seemed to be getting thin, but was not ill. Towards the end of January its condition improved, and it remained well until it was killed in April.

Temperature.

The temperature rose to 40·0° C. on the thirteenth day after the first feed. Subsequently it was irregular, but not at any time high, the maximum range of variation recorded during four months being from 40·1° C. to 37·7° C. (2·4° C.).

Tuberculin Test.

February 8, 1907. [78 days after inoculation.] No reaction. Rise of temperature, 0·1° C.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Alimentary Tract.

Tongue, Pharynx, Palate.—Normal.

Submaxillary Glands.—Normal.

Intestines and Mesenteric Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—On the surface there were scattered translucent submiliary nodules, some with minute opaque centres. There were also several larger nodules, the size of millet seeds, which consisted of a grey capsule with a cavity containing a little whitish substance. In one the pneumonyssus was observed. (All the lesions in the lung were found to be parasitic.)

Bronchial Glands.—Normal.

Heart.—Normal.

Abdomen.

Peritoneum, Spleen, Kidneys.—Normal.

Liver.—In the liver there was a pea-sized soft grey nodule with a central cavity (not tuberculous).

Various Lymphatic Glands.

Prescapular, Axillary, Inguinal, Cervical, Lumbar, Iliac.—Normal.

Microscopical Examination.

Three smears from nodules in the lung were examined ; no tubercle bacilli were seen.

RHESUS MONKEY 164. Virus A I.

Fed once with culture derived from the original material.

Dose—500·0 milligrammes.

Date of Feeding—November 22, 1906.

Killed—April 8, 1907. [137 days later.]

Clinical Notes.

During December and January the animal did not grow and looked rather thin and depressed.

Subsequently its condition was much improved, and it was quite well when killed in April.

Temperature.

The temperature was somewhat raised during the second and third weeks, reaching a maximum of 39·9 C. on the 14th day. Subsequently it was approximately normal.

Tuberculin Test.

February 8, 1907. [78 days after inoculation.] No reaction. No rise of temperature.

POST-MORTEM EXAMINATION.

Carcass was in fair condition, and had a little subcutaneous fat.

Alimentary Tract.

Tongue, Pharynx, Palate.—Normal.

Tonsils.—In the right tonsil there was a soft purulent focus.

Submaxillary Glands.—Normal.

Intestines.—Normal.

Mesenteric Glands.—In one gland there was a minute soft opaque yellowish focus.

Thorax.

Pleura, Lungs, Thoracic Glands, Heart.—Normal.

Abdomen.

Peritoneum, Liver, Spleen, Kidneys.—Normal.

Various Lymphatic Glands.

Prescapular, Cervical, Axillary, Inguinal, Lumbar, Iliac.—Normal.

Microscopical Examination.

Right Tonsil.—No tubercle bacilli ; masses of many varieties of blue-staining organisms.

Mesenteric Gland.—No tubercle bacilli ; a few blue-staining organisms.

VIRUS A II. (Spleen of a Pigeon).

CULTURE INOCULATIONS.

I.—May 22, 1906.

Strain derived from original material. Total duration of cultivation, 69 days. The 4th generation of culture was used, 21 days old.

CHIMPANZEE 20.

Subcutaneous.
Dose : 50·0 mg.
Died : March 25, 1908.
673 days.

P.M. — Linear white scars in the skin of the back. No tuberculosis elsewhere.

CALF 432.

Subcutaneous.
Dose : 50·0 mg.
Killed : Aug. 31, 1906.
101 days.

P.M.—Small local tumour. About half the adjacent prescapular gland was composed of grey translucent necrotic tissue with gritty foci. A few small tubercles were seen in the lungs, thoracic and portal glands, in several mesenteric glands, small intestine, and right suprarenal.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
886	Intrav.	1·0 mg.	D. 17 days	Acute T.
887	Intrav.	0·1 mg.	D. 20 ,,	Acute T.
885	Intrap.	1·0 mg.	D. 11 ,,	T.B. in organs.
884	Subcut.	10·0 mg.	K. (ill) 143 days.	Chronic G. T.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2038	Intrap.	1·0 mg.	D. 23 days	Acute avian T.
2040	Intrap.	0·1 mg.	D. 84 ,,	Local T.
2037	Subcut.	10·0 mg.	K. 198 ,,	Local T.
2039	Subcut.	1·0 mg.	D. 11 ,,	Local T.

II.—August 9, 1906.

The strain was derived from the original material and had been in cultivation a total period of 148 days.

The 6th generation of culture was used, 29 days old.

FOWLS.

Number.	Method.	Dose.	Duration of Life.	Result.
96	Intrav.	10·0 mg.	D. 37 days	G. T.
94	Intrav.	1·0 mg.	D. 30 ,,	G. T.
92	Intrav.	0·1 mg.	D. 29 ,,	G. T.

VIRUS A II. (Spleen of a Pigeon)—*continued.*

CULTURE INOCULATIONS—*continued.*

III.—March 1, 1907.

The strain was derived from the original material and had been in cultivation a total period of 353 days.

The culture used was the 9th generation, 20 days old.

RATS.

Number.	Method.	Dose.	Duration of Life.	Result.
120	Intrap.	50·0 mg.	D. 247 days	Numerous T.B. in organs.
121	Intrap.	50·0 mg.	D. 164 ,,	Ditto.
119	Intrap.	10·0 mg.	K. 188 ,,	Ditto.
122	Subcut.	100·0 mg.	K. 255 ,,	No T. T.B. in spleen.

GOAT 38.

Fed, once only.
Dose : 100·0 mg.
Killed : June 19, 1907.
110 days.

P.M.—In the small intestine were two small soft caseous gritty nodules. The coeliac and one mesenteric gland contained small soft caseous gritty patches and nodules. There was no tuberculosis elsewhere.

FOWLS.

Number.	Method.	Dose.	Duration of Life.	Result.
212	Intrap.	10·0 mg.	D. 67 days	G. T.
210	Subcut.	10·0 mg.	D. 133 ,,	G. T.
214	Fed.	10·0 mg.	D. 201 ,,	G. T.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1258	Intrap.	1·0 mg.	D. 18 days	Acute T.
1260	Subcut.	50·0 mg.	D. 81 ,,	G. T.
1262	Fed	50·0 mg.	D. 59 ,,	Severe local T.
1261	Fed	10·0 mg.	D. 217 ,,	Chronic G. T.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2385	Intrap.	1·0 mg.	D. 46 days	S. T.
2386	Subcut.	50·0 mg.	D. 50 ,,	Local T.

CALF 432. A II.

Subcutaneous Inoculation of culture derived from the original material.

Dose—50·0 milligrammes.

Date of Inoculation—May 22, 1906. [Age 5 weeks.]

Killed when in good health—August 31, 1906. [101 days after inoculation.]

Clinical Notes.

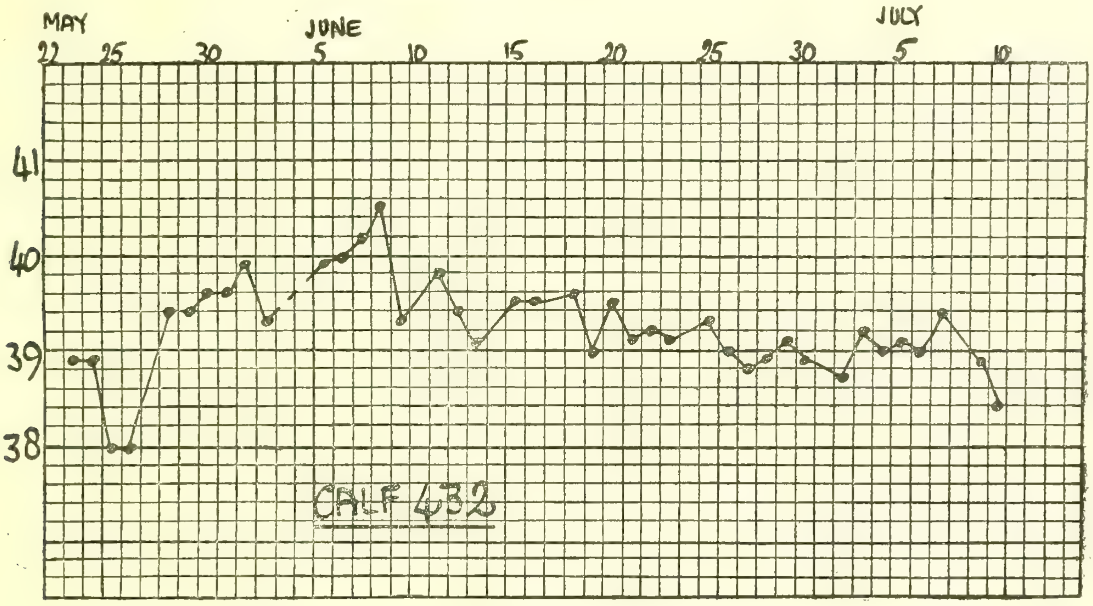
Eighteen days after inoculation on the left side of the neck there was a firm subcutaneous thickening measuring 6·3 by 5 cm. by about 1 cm. in greatest thickness.

On the 35th day the thickening had diminished a little in extent. The left prescapular was probably normal in size; it was 5 cm. long.

Subsequently the local thickening was replaced by a small oval tumour, and the prescapular gland became definitely enlarged.

The calf remained in good health during the experiment.

Temperature. (Chart to July 10.)



From July 10 to August 31 the temperature remained normal.

Weights.

	Kilos.
May 22	28·57
July 17	47·16
August 31	61·22

Total gain of weight during experiment.—32·60 kilos.

Average rate of gain per week.—2·2 kilos.

Local Lesion.—At the seat of inoculation, on the left side of the neck, was an oval tumour measuring 5 by 4·5 by 2 cm.

Left Prescapular Gland.—The left prescapular gland measured 6·3 by 3·8 by 2·5 cm. On section rather more than half the cortex was replaced by grey translucent necrotic tissue with opaque gritty foci, and about half the medulla was filled up with a similar mass.

The Right Prescapular, Prepectoral and Axillary Glands were normal.

Thorax.

Pleura.—Normal.

Lungs.—Scattered throughout the lungs were minute congested foci. In addition, in the right middle lobe there were six grey tubercles with slightly opaque centres; the largest, 1·5 mm. in diameter, on section contained a minute calcareous centre.

Thoracic Glands.—The bronchial glands on each side contained in their cortices scattered irregular yellowish gritty tubercles up to 1·5 mm. in diameter. The long mediastinal gland contained similar tubercles. One of the other mediastinal glands contained a tubercle.

Heart.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen and Liver.—Normal.

Portal Glands.—Three portal glands contained a few yellow gritty foci.

Kidneys.—Normal.

Suprarenals.—The right contained in the cortex one pinhead-sized yellow caseo-calcareous tubercle. The left was normal.

Renal, Lumbar, and Iliac Glands.—Normal.

Alimentary Tract.

Tongue, Pharynx, Palate, Tonsils.—Normal.

Pharyngeal, Submaxillary, Hyoid, and Parotid Glands.—Normal.

Stomach.—Normal.

Intestines.—In the first foot of the small intestine there were eight soft yellow tubercles up to a pinhead in size. In the rest of the small intestine three were counted.

The large intestine was normal.

Mesenteric Glands.—Many of the mesenteric glands showed punctiform hæmorrhages, and in some of these close beneath the capsule could be seen very small irregular yellow foci. In one gland there was a distinctly yellow necrotic patch about the size of a wheat grain. Many of these small foci had a yellow periphery with a transparent centre, and they cracked on pressure.

Ileo-colic and Colic Glands.—Normal.

Testes.—Normal.

Various Lymphatic Glands.

Precrural, Popliteal, Gluteal, Ischiatic, Pudic.—Normal.

Microscopical Examination.

Emulsion of Mediastinal Gland.—No tubercle bacilli seen.

Tubercle from Lung.—No tubercle bacilli seen.

Focus from Mesenteric Gland.—No tubercle bacilli seen.

Caseous patch from Mesenteric Gland.—No tubercle bacilli seen.

Tubercle from Small Intestine.—Four tubercle bacilli seen.

Tubercle from Suprarenal.—Numerous tubercle bacilli.

GOAT 38. Virus A II.

Fed once with culture derived from the original material.

Dose—100·0 milligrammes.

Date of Feeding—March 1, 1907. [Age about 10 months.]

Killed when in good health—June 19, 1907. [110 days after feeding.]

Clinical History.

The animal showed no sign of ill health during the experiment.

Temperature.

The temperature rose to 40·1° C. on the 20th day and fell to 39·2° C. three days later; subsequently it varied between 38·9° C. and 39·6° C.

Tuberculin Tests.

April 9, 1907. Dose 2·0 cc. of bovine tuberculin. [39 days after the experiment began.] Positive reaction. Rise of temperature 2·1° C.

April 30, 1907. Dose 4·0 cc. of avian tuberculin. [60 days after the experiment began.] Positive reaction. Rise of temperature 1·8° C.

June 13, 1907. Dose 2·0 cc. of bovine tuberculin. [104 days after the experiment began.] Positive reaction. Rise of temperature 1·2° C.

POST-MORTEM EXAMINATION.

General condition good.

Tongue.—Normal.

Tonsils.—Normal.

Larynx and Pharynx.—Normal.

Submaxillary Glands.—Normal.

Pharyngeal Glands.—Normal.

Cervical Glands.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Intestines.—In the small intestine there were two soft caseous slightly gritty nodules, the largest the size of a millet seed.

The large intestine was normal.

Coeliac Glands.—The glands situated dorsally and to the left of the cardiac orifice of the stomach contained a moderate number of irregular yellowish nodules and small patches composed of soft caseous slightly gritty substance.

Mesenteric Glands.—The mesenteric glands were normal with the exception of one terminal gland which contained in the cortex soft yellow caseous slightly gritty nodules easily shelled out from the gland substance.

Spleen.—The spleen appeared normal.

Liver.—Normal.

Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenals.—Normal.

Lumbar, Iliac, and Renal Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—In the right posterior lobe there was one small firm grey patch and in the rest of the lung an occasional grey nodule which did not appear to be tuberculous.

Bronchial and Mediastinal Glands.—Normal.

Heart.—Normal.

Various Lymphatic Glands.

Parotid, Prescapular, Axillary, Precrural, Popliteal, and Gluteal Glands.—Normal.

Microscopical Examination.

(Smear Preparations.)

Lung (grey patch).—No tubercle bacilli seen.

Coeliac Gland (gland near cardiac orifice of stomach).—No tubercle bacilli seen.

Mesenteric Gland (emulsion).—Two tubercle bacilli seen.

Small Intestine (nodule No. I).—One tubercle bacillus seen.

Small Intestine (nodule No. II).—? One tubercle bacillus seen.

CHIMPANZEE 20. Virus A II.

Subcutaneous inoculation of culture derived from the original material.

Dose—50·0 milligrammes.

Date of Inoculation—May 22, 1906.

Died—March 25, 1908. [673 days after inoculation.]

Clinical Notes.

During the three weeks immediately following the inoculation the animal seemed at times a little unwell, and its appetite was not so good as usual. On the 18th day there was a slightly raised firm swelling at the seat of inoculation measuring 5 by 4 cm. An axillary gland on the right side appeared to be enlarged.

On the 35th day after inoculation the local swelling was fluctuating and measured about 5 by 4 cm.; the skin over it was thinned and reddened and showed two small ulcers discharging yellowish pus. The animal was well.

Subsequently the discharge ceased and the swelling diminished in size being finally represented only by a small raised thickening.

The animal subsequently showed no sign of ill health until shortly before its death when it developed diarrhoea.

Tuberculin Test.

February 8, 1907. [262 days after the experiment began.] Dose of tuberculin (bovine) 1·0 cc. No reaction.

POST-MORTEM EXAMINATION.

General condition fair.

Local Lesion.—At the seat of inoculation in the skin of the back there were four white linear scars the largest 12·5 mm. in length, and the skin seemed puckered.

All organs and glands appeared normal and there was no sign of tuberculosis.

VIRUS A III. (Lung of a Crane).

CULTURE INOCULATIONS.

I.—JULY 14, 1906.

The strain was derived from the original material, and had been in cultivation a total period of 108 days.

The culture used was the 4th generation, 22 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
990	Intrav.	0·1 mg.	D. 33 days	G.T.
992	Intrap.	0·1 mg.	D. 39 „	G.T.
988	Subcut.	10·0 mg.	D. 157 „	Chronic T.
989	Subcut.	10·0 mg.	D. 93 „	Chronic G.T.

GUINEA-PIGS.

Number.	Method.	Dose	Duration of Life.	Result.
2145	Intrap.	1·0 mg.	K. 184 days	Local T.
2146	Intrap.	0·1 mg.	K. 184 „	Local T.
2143	Subcut.	10·0 mg.	K. 184 „	Local T.
2144	Subcut.	10·0 mg.	K. 184 „	Local T.

CALF 520. Virus A III.

Subcutaneous inoculation of culture derived from the original material.

Dose—100·0 milligrammes.

Date of Inoculation—February 6, 1907. [Age: 9 months.]

Killed when in good health—June 8, 1907. [122 days after inoculation.]

Temperature.

The temperature remained normal throughout.

Tuberculin Tests.

May 7, 1907. Dose 3·0 cc. bovine tuberculin. [90 days after inoculation.] Negative. No rise of temperature.

June 6, 1907. Dose 5·0 cc. bovine tuberculin. [120 days after inoculation.] Negative. No rise of temperature.

Weights.

	Kilos.
February 6, 1907	212·27
June 8, 1907	222·27

Total gain of weight.—10 kilos.

POST-MORTEM EXAMINATION.

General condition good.

Local Lesion.—The local lesion in the subcutaneous tissue on the left side of the neck measured 8·5 by 6 by 4 cm. On section it consisted of a fibrous cyst lined with greyish granulation tissue and filled with a mucoid caseo-purulent substance.

Left Prescapular Gland.—The left prescapular gland measured 7·6 by 3·5 by 1·7 cm. On section it contained a cyst the size of a sparrow's egg filled with yellow caseo-pus together with a firmer mass of caseous substance beneath the capsule. There was also a small caseo-purulent nodule and scattered minute soft opaque foci.

Right Prescapular Gland.—The right prescapular gland measured 8 by 3·7 by 2·1 cm. It was swollen as the result of a recent tuberculin inoculation. On section it was normal.

Prepectoral, Cervical, and Axillary Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—Normal.

Thoracic Glands.—In the long mediastinal gland there were in the cortex a moderate number of minute discrete irregular soft caseous foci. In a second mediastinal gland and in a bronchial gland there were one or two similar foci.

Heart.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Intestines.—In the small intestine there were three small greyish elevations of mucous membrane each with a minute yellow purulent centre.

Mesenteric Glands.—Many of the mesenteric glands contained each a single soft caseous tubercle the size of a millet seed easily shelling out of the gland substance.

Spleen.—Normal.

VIRUS A III. (Lung of a Crane).

CULTURE INOCULATIONS.

II.—February 6, 1907.

The strain was derived from the original material, and had been in cultivation a total period of 315 days.

The culture used was the 4th generation, 22 days old.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2369	Intrap.	10·0 mg.	D. 13 days	Acute avian T.
2368	Intrap.	5·0 mg.	D. 17 ,,	
2370	Intrap.	1·0 mg.	D. 19 ,,	Subacute avian T.
2367	Intrap.	1·0 mg.	D. 35 ,,	

February 19, 1907.

RATS.

Fed with organs of G.P. 2369.

Number.	Method.	Duration of Life.	Result.
116	Fed	D. 113 days	Healthy.
117	Fed	K. 198 ,,	T.B. in spleen, kidney, and mesenteric gland.
118	Fed	K. 265 ,,	Healthy.

FOWL 200.

Subcutaneous.
Dose : 10·0 mg.
Died : 101 days.

P.M.—General Tuberculosis.

CALF 520.

Subcutaneous.
Dose : 100 0 mg.
Killed : June 8, 1907.
122 days.

P.M. — Cystic local tumour. The left prescapular gland contained a large cyst full of caseopus, and other caseous softened lesions. In the thoracic and mesenteric glands were sparsely scattered caseous foci. In the liver a single minute grey tubercle was seen.

GUINEA-PIGS.

Material Inoculated.	Number.	Method.	Duration of Life.	Result.
E. of local lesion.	2512	Intrap.	K. 107 days	Local T.
	2513	Intrap.	K. 107 ,,	
E. of prescapular gland.	2514	Intrap.	K. 107 ,,	Local T.
	2515	Intrap.	K. 107 ,,	

GOAT 40.

Subcutaneous.
Dose : 100·0 mg.
Killed : June 14, 1907.
128 days.

In the lungs there was a number of caseo-purulent nodules, and some grey nodules with caseo-calcareous centres The thoracic glands contained scattered caseous gritty tubercles or small calcareous foci. In the stomach and intestines were a few scattered tubercles, one was ulcerated. In the mesenteric and many other abdominal glands were numerous caseous gritty nodules. In the liver and kidneys were one or two small tubercles.

GUINEA-PIGS.

Material Inoculated.	Number.	Method	Duration of Life.	Result.
E. of local lesion.	2518	Intrap.	K. 118 days	Local T.
	2519	Intrap.	K. 153 ,,	
E. of prescapular gland.	2516	Intrap.	K. 153 ,,	Local T.
	2517	Intrap.	K. 118 ,,	
E. of lung ...	2521	Intrap.	K. 153 ,,	Local T.
E. of mesenteric gland.	2520	Intrap.	K. 153 ,,	

CAT 92.

Subcutaneous.
Dose : 10·0 mg.
Died : March 27, 1907.
49 days.

P.M.—Ulcer in the skin and caseation of axillary glands. No tuberculosis elsewhere.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1236	Intrav.	1·0 mg.	D. 19 days	G.T.
1237	Intrap.	1·0 mg.	K 211 ,,	Chronic T. (intra-caecal).
1238	Fed	5·0 mg.	K. 464 ,,	Slight local T.

February 25, 1907.

CAT 94.

Fed with organs from Rabbit 1236.
Killed : June 12, 1907.
107 days.

P.M.—A few foci in a Peyer's patch containing tubercle bacilli. No tuberculosis elsewhere.

RATS.

Number.	Method.	Dose.	Duration of Life.	Result.
108	Intrap.	50·0 mg.	D. 24 days	Numerous T.B. in organs.
109	Intrap.	10 0 mg.	D. 285 ,,	Ditto.
110	Intrap.	10·0 mg.	D 20 ,,	Ditto.
111	Intrap.	1·0 mg.	D. 376 ,,	Omental nodules and a few T.B. in organs.
112	Subcut.	50·0 mg.	D. 8 ,,	T.B. in organs.
113	Subcut.	10·0 mg.	D. 18 ,,	Ditto.
114	Subcut.	10·0 mg.	D. 290 ,,	Slight local T. Few T.B. in organs.
115	Subcut.	1·0 mg.	K 278 ,,	No local T. T.B. in spleen.

Liver.—In the liver there was a single minute grey translucent tubercle.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Renal, Lumbar, and Iliac Glands.—Normal.

Tongue, Tonsils, Larynx, and Pharynx.—Normal.

Various Lymphatic Glands.

Precrural, Coeliac, Popliteal, Gluteal, Pudic, Submaxillary, and Pharyngeal Glands.—Normal.

Microscopical Examinations.

(Smear Preparations.)

Local Lesion.—Tubercle bacilli very numerous.

Prescapular Gland (left). — Tubercle bacilli numerous.

Liver (tubercle).—One tubercle bacillus seen.

Mediastinal Gland (tubercle). — A few tubercle bacilli seen.

Mesenteric Gland (nodule).—Moderately numerous tubercle bacilli.

Small Intestine (purulent focus). — No tubercle bacilli seen.

GOAT 40. Virus A III.

Subcutaneous inoculation of culture derived from the original material.

Dose—100·0 milligrammes.

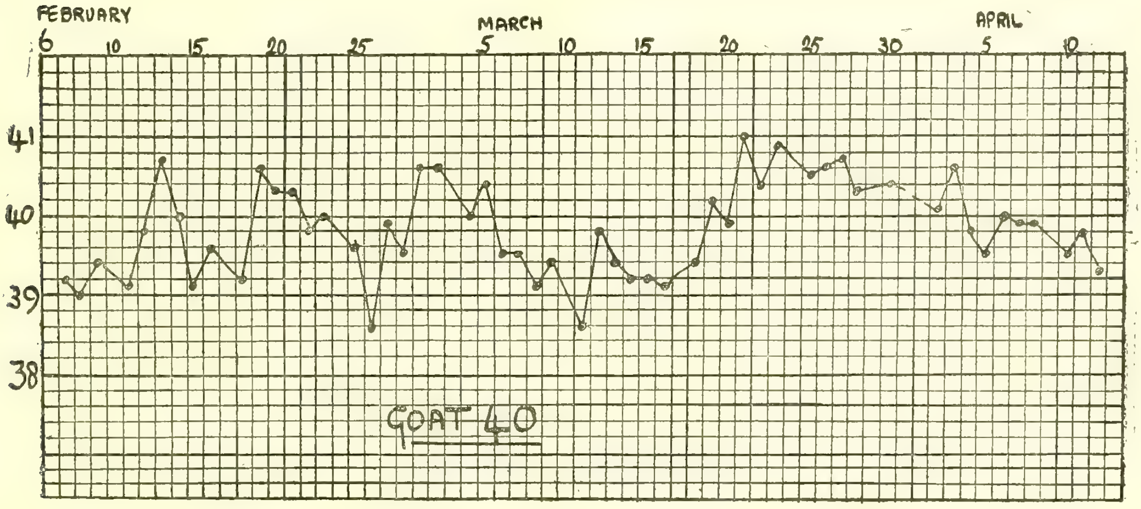
Date of Inoculation—February 6, 1907. [Age 10 months.]

Killed—June 14, 1907. [128 days after inoculation.]

Clinical History.

On the left side of the neck, 17 days after inoculation, there was an ill-defined tumour about 8·2 by 5·1 cm. The centre of the tumour fluctuated and the surrounding swelling extended on to the front of the neck. Subsequently the tumour became more prominent and fluctuant and finally ulcerated. Both prescapular glands became enlarged, the ulcer having extended on to the right side of the neck. Subsequently the ulcer slowly healed. At no time was there any obvious sign of ill-health.

Temperature



The temperature during the first two months is shown above. From April 10 to June 14 the temperature was irregular and somewhat raised, the maximum range of variation being from 38·7° C. to 40·6° C.

Tuberculin Tests.

April 9, 1907. Dose 2·0 cc. of bovine tuberculin. [62 days after inoculation.] Rise of temperature 0·6° C., from 40·7° to 41·3° C.

April 30, 1907. Dose 4·0 cc. of avian tuberculin. [83 days after inoculation.] Rise of temperature 1·2° C., from 40·2° to 41·4° C.

June 13, 1907. Dose 2·0 cc. of bovine tuberculin. [127 days after inoculation.] Rise of temperature 1·3° C., from 39·9° to 41·2° C.

Weight when killed—12.24 kilos.

POST-MORTEM EXAMINATION.

General condition fair.

Local Lesion.—At the seat of inoculation on the left side of the neck there were in the skin two small ulcers and one linear ulcer covered with scabs, these being all that remained of the large deep ulcer which developed soon after inoculation. In the subcutaneous tissue and in the muscle there was a lobulated tumour measuring about 8 by 6 cm., which consisted of cicatrical tissue and muscle closely beset with caseous nodules varying in size from a millet seed to a sparrow's egg, the majority being small. The largest consisted of grey translucent capsules filled with yellow caseo-pus; the smallest were caseous and often slightly gritty.

Left Prescapular Gland.—The left prescapular gland was enlarged and rounded and about the size of a duck's egg measuring 7 by 5 by 4 cm. On section it consisted throughout of caseo-necrotic tissue with fine gritty streaks; it was pinkish in parts and rather friable. The capsule was thickened.

Lesion on the right side of the Neck.—On the right side of neck almost in middle there was a small subcutaneous tumour, the size of a sparrow's egg which on section consisted of a fibrous-walled cyst lined with granulation tissue and filled with mucoid caseo-pus.

There were some discrete soft caseous tubercles in the muscle between the two tumours.

Right Prescapular Gland.—The right prescapular gland measured 5 by 2·8 by 1·4 cm. On section it was oedematous and contained at one extremity a caseous slightly gritty nodule measuring about 6 mm. in diameter with several opaque yellow foci in the tissue around it.

Prepectoral Glands.—The left reniform prepectoral gland was oedematous. The left round gland was normal.

In the right reniform prepectoral gland there was a caseo-calcareous submiliary tubercle.

Cervical Glands.—The left inferior cervical gland was enlarged and measured 1·2 cm. in diameter. On section it was oedematous and contained one caseous miliary tubercle and two opaque foci.

The right inferior cervical gland was normal.

A left middle cervical gland contained several discrete caseous tubercles the size of hemp seed.

Thorax.

Pleura.—Normal.

Lungs.—The lungs were crepitant. In the right anterior lobe there were several firm reddish grey lobules; these on section contained yellow caseo-purulent nodules which shelled out, leaving cavities. In the right tongue shaped piece the consolidation was similar but more extensive, the lobules coalescing and containing more numerous purulent nodules. In the right posterior lobe there were scattered discrete grey nodules up to 6 mm. in diameter; they were grey and translucent with caseo-calcareous centres.

The left lung was affected similarly to the right, the tongue shaped piece being also more extensively affected than the rest of the lobe.

Dorsal Mediastinal Glands.—These glands contained discrete caseous gritty tubercles varying up to a millet seed, the gland being not much enlarged.

Bronchial Glands.—The bronchial glands were small and contained occasional minute calcareous tubercles.

Heart.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Diaphragm.—Normal.

Stomach.—In the wall of the stomach just beneath the peritoneum there was a caseous tubercle the size of a rape seed. Beneath the mucous membrane and projecting slightly there was a second nodule the size of a millet seed, grey with a yellowish purulent centre.

Intestines.—On the mucous surface of the small intestine there were seven scattered opaque tubercles varying from a point up to nearly a millet seed; one in a Peyer's patch was ulcerated.

In the large intestine on the surface there were three soft caseous miliary tubercles.

Mesenteric Glands.—The cortices of the mesenteric glands were rather closely filled with irregular caseous gritty nodules; they affected the superficial part of the cortex which from the surface seemed to be about half replaced. On section they were easily picked out leaving cavities in the gland; some covered a considerable area up to 1 cm. or more in superficial diameter.

Pancreatic Glands.—Two glands in the pancreas contained in the cortices caseous gritty tubercles the size of rape seed.

Spleen.—The spleen appeared normal.

Liver.—Except for one small irregular collection of opaque foci the liver appeared normal.

Portal Glands.—The portal glands were beset with discrete opaque nodules. The larger were caseous and gritty, easily shelling out, resembling the mesenteric glands. The small (the majority) were merely calcareous grains also easily shelling out.

Kidneys.—The left kidney contained one opaque miliary tubercle. The right was normal.

Suprarenal Bodies.—Normal.

Lumbar Glands.—In the lumbar glands there was an occasional opaque tubercle.

Iliac Glands.—The iliac glands contained in the cortices discrete caseo-calcareous submiliary tubercles.

Pharynx, Larynx, Tongue, Tonsils, and Trachea.—Normal.

Various Lymphatic Glands.

Precrural Glands.—Normal.

Popliteal Glands.—Normal.

Submaxillary Glands.—The right contained a calcareous grain; the left a caseous tubercle.

Parotid Glands.—There was a calcareous grain in each.

Left Posterior Pharyngeal Gland.—The gland was considerably enlarged, being nearly twice the size of the right, and contained in the cortex caseo-calcareous tubercles and nodules replacing a considerable part of the gland substance; they were all easily picked out.

Right Posterior Pharyngeal Gland.—This contained several calcareous grains the size of rape seed, easily picked out from the gland substance.

Microscopical Examination.

(Smear Preparations.)

Left Local Lesion showed numerous tubercle bacilli.

Right Local Lesion showed moderately numerous tubercle bacilli.

Left Prescapular Gland showed numerous tubercle bacilli.

Lung (emulsion).—Two tubercle bacilli seen.

Portal Gland showed a few tubercle bacilli.

Mesenteric Gland showed a few tubercle bacilli.

Large Intestine showed a few tubercle bacilli.

Small Intestine showed a few tubercle bacilli.

Stomach.—No tubercle bacilli seen.

CAT 92. Virus A III.

Subcutaneous inoculation with culture derived from the original material.

Dose—10·0 milligrammes.

Date of Inoculation—February 6, 1907.

Died—March 27, 1907. [49 days after inoculation.]

Weights.

	grammes.
February 6, 1907	2090
March 27, 1907	1140

Loss in weight.—950 grammes.

POST-MORTEM EXAMINATION.

Local Lesion.—In the skin of the back to the right of the middle line there was a small circular ulcer 6 mm. in diameter, communicating with a smooth walled cavity in the subcutaneous tissues which contained a little turbid serum.

Axillary Glands.—The right axillary gland was enlarged and about half replaced by firm caseous substance.

A second gland on the ribs was enlarged and beset with caseous foci.

The left axillary glands were normal.

Inguinal Glands.—Normal.

Thorax.

Lungs.—On the surface of the lungs there were some small grey patches from which on section a little pus exuded. The lungs were otherwise normal.

Bronchial Glands.—Normal.

Abdomen.

On the mesentery there was a number of flattened glassy bodies with white streaks in the centre.

Other organs and lymphatic glands showed no tuberculosis.

Microscopical Examinations.

(Smear Preparations.)

Axillary Gland.—Very numerous tubercle bacilli.

Lung (substance).—No tubercle bacilli.

Liver (substance) —No tubercle bacilli.

Spleen (substance).—No tubercle bacilli.

Kidney (substance).—No tubercle bacilli

CAT 94. Virus A III.

Fed once with the organs of Rabbit 1236 [Inoculated intravenously with 1·0 mg. of culture derived from the original material.]

Date of Feeding—February 25, 1907.

Killed when in good health—June 12, 1907. [107 days after the experiment began.]

Weights.

	grammes.
February 25, 1907	3400
June 12, 1907	3120

Loss.—280 grammes.

POST-MORTEM EXAMINATION.

General condition good.

Intestines. — The Peyer's patches showed some opaque foci.

Mesenteric Glands.—The mesenteric glands were not enlarged and showed no opacities.

No tuberculous lesion could be seen in any other organ or lymphatic gland.

Microscopical Examinations.

(Smear Preparations.)

Peyer's patch.—Four tubercle bacilli seen.

Mesenteric Gland I.—A few tubercle bacilli seen.

Mesenteric Gland II.—Two tubercle bacilli seen.

VIRUS A IV. (Liver of a Pheasant).

CULTURE INOCULATIONS.

I.—July 4, 1906.

Strain derived from original material. Total duration of cultivation, 89 days.

The 4th generation of culture was used, 22 days old.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2131	Intrap.	1·0 mg.	K. 180 days	Local T.
2132	Intrap.	0·1 mg.	D. 49 ,,	Local T.
2129	Subcut.	10·0 mg.	K. 182 ,,	Local T.
2130	Subcut.	1·0 mg.	K. 183 ,,	Local T.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
963	Intrav.	0·1 mg.	D. 26 days	G. T.
964	Intrap.	1·0 mg.	D. 171 ,,	Chronic G. T.
965	Intrap.	0·1 mg.	D. 41 ,,	G. T.
961	Subcut.	10·0 mg.	D. 140 ,,	Chronic G. T.
962	Subcut.	10·0 mg.	K. 104 ,,	Slight G. T.

CALF 456.

Subcutaneous.
Dose : 50·0 mg.
Killed : October 20, 1906.
108 days.

P.M.—Caseo-calcareous and fibroid tumour at seat of inoculation The left prescapular gland contained four caseo-calcareous nodules. There was no tuberculosis elsewhere

II.—August 22, 1906.

The strain was derived from the original material, and had been in cultivation a total period of 138 days. The culture used was the 4th generation, 23 days old.

FOWLS.

Number.	Method.	Dose.	Duration of Life.	Result.
108	Intrav.	50·0 mg.	D. 35 days	G. T.
106	Intrav.	10·0 mg.	D. 67 ,,	G. T.
104	Intrav.	1·0 mg.	D. 35 ,,	G. T.

*CULTURE.

Strain derived from prescapular gland of Calf 456. Total duration of cultivation, 61 days. The 4th generation of culture was used on December 20, 1906, when 21 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1160	Intrav.	1·0 mg.	D. 17 days	Acute T.
1159	Intrav.	0·1 mg.	D. 20 ,,	
1161	Intrap.	1·0 mg.	D. 15 ,,	Early G.T.
1158	Intrap.	0·1 mg.	D. 16 ,,	
1157	Subcut.	10·0 mg.	D. 28 ,,	G. T.
1156	Subcut.	1·0 mg.	D. 59 ,,	G. T.
1155	Subcut.	0·1 mg.	D. 41 ,,	G. T.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2266	Intrap.	1·0 mg.	D. 52 days	G. T.
2264	Intrap.	0·1 mg.	D. 15 ,,	G. T.
2265	Subcut.	1·0 mg.	D. 41 ,,	G. T.
2263	Subcut.	0·1 mg.	D. 48 ,,	G. T.

FOWL 170.

Intravenous.
Dose : 1·0 mg.
Killed : 89 days

P.M. — No sign of tuberculosis. Three T.B. seen in smear from spleen.

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* This culture was mammalian in type resembling a bovine tubercle bacillus.

VIRUS A IV. (Liver of a Pheasant).

CULTURE INOCULATIONS.

III.—JANUARY 29, 1907.

The strain was derived from the original material. The total duration of cultivation was 322 days.

The culture used was the 7th generation, 21 days old.

CALF 494.

Subcutaneous.

Dose { 50·0 mg. into left side of neck.
1·0 mg. into right side of neck.

Killed : July 2, 1907.

154 days.

P.M.—On each side of the neck there was a small cystic tumour. The left prescapular gland was largely composed of two caseo-necrotic softened gritty nodules. The right contained only three small caseous nodules. In the liver there was a single small tubercle.

GUINEA-PIGS.

Number.	Method.	Dose	Duration of Life	Result.
2354	Intrap.	1 0 mg.	D. 45 days	Subacute avian T.
2356	Subcut.	1·0 mg.	D. 80 ,,	Local T.

GUINEA-PIGS.

Material Inoculated.	Number.	Method.	Duration of Life.	Result.
E. of left local lesion.	2549	Intrap.	K. 153 days	Local T.
	2550	Intrap.	K. 196 ,,	
E. of right local lesion.	2546	Intrap.	K. 196 ,,	No T.
E. of left prescapular gland.	2547	Intrap.	K. 153 ,,	Local T.
	2548	Intrap.	K. 196 ,,	No T.
E. of right prescapular gland.	2545	Intrap.	K. 153 ,,	No T.

RABBIT 1601.

Intravenous inoculation.

E. of omentum from G.P. 2550.

Killed : 121 days. No tuberculosis.

CULTURE INOCULATIONS.

NOVEMBER 9, 1907.

Culture derived from prescapular gland of Calf 494, 4th generation, 21 days old. Total duration of cultivation 130 days.

MICE.

Number.	Method.	Dose.	Duration of Life.	Result
93	Intrap.	40·0 mg	D. 53 days	
91	Intrap.	20·0 mg.	D. 192 ,,	
92	Intrap.	20·0 mg.	D 348 ,,	For post-mortem results see Tables, pages 237–239.
94	Intrap.	10·0 mg.	D. 279 ,,	
95	Intrap.	4·0 mg.	D. 31 ,,	
96	Intrap.	2·0 mg.	D. 86 ,,	
97	Intrap.	1·0 mg.	D. 26 ,,	
98	Intrap.	0·2 mg.	D. 180 ,,	
90	Subcut.	40·0 mg.	D. 280 ,,	
89	Subcut.	20·0 mg.	D. 81 ,,	
88	Subcut.	20·0 mg.	D. 143 ,,	
87	Subcut.	10·0 mg.	D. 277 ,,	
86	Subcut.	4·0 mg.	K. 333 ,,	
85	Subcut.	2·0 mg.	K. 243 ,,	
84	Subcut.	1·0 mg.	D. 200 ,,	
83	Subcut.	0·2 mg.	D. 155 ,,	

CALF 568.

Subcutaneous.

Dose : 100·0 mg.

Killed : May 8, 1908.

181 days.

P.M.—Cyst containing caseo-pus at seat of inoculation. Two caseo-calcareous nodules in prescapular gland. One translucent nodule in the lung.

GUINEA-PIGS.

Material Inoculated.	Number.	Method.	Duration of Life.	Result.
E. of local lesion.	3170	Subcut.	K. 57 days	No T.
	3171	Subcut.	K. 113 ,,	No T.
E. of prescapular gland.	3168	Subcut.	K. 57 ,,	Local T.
	3169	Subcut.	K. 113 ,,	Local T.

GUINEA-PIGS.

Number.	Method.	Dose	Duration of Life.	Result.
2903	Subcut.	50·0 mg.	D. 118 days	Local T.
2904	Subcut.	10·0 mg.	D. 120 ,,	Local T.

CALF 456. Virus A IV.

Subcutaneous inoculation of culture derived from the original material.

Dose—50·0 milligrammes.

Date of Inoculation—July 4, 1906.

Weight at Inoculation—59·86 kilos. [Age about 13 weeks.]

Killed when in good health—October 20, 1906. [108 days after inoculation.]

Clinical Notes.

A small circular swelling developed at the seat of inoculation on the left side of the neck, and the left prescapular gland became slightly enlarged. The calf remained in good health and grew normally during the period of the experiment.

Temperature.

On the third day after inoculation the temperature rose to 39·7° C. It then remained normal until the 12th day when it rose to 39·9° C. On the 14th day it was again normal (38·9° C.) and remained normal subsequently.

Tuberculin Test.—The calf was not tested subsequent to inoculation.

Weights.

	Kilos.
July 4, 1906	59·86
July 17, 1906	66·21
October 20, 1906 ...	97·95

Total gain of weight—38·09 kilos.

Average rate of gain per week—2·53 kilos.

POST-MORTEM EXAMINATION.

General condition very good.

Local Lesion.—In the subcutaneous tissues on the left side of the neck there was a flattened oval tumour measuring 7 by 5·7 by 1·3 cm. On section it consisted of grey translucent tissue with a caseo-calcareous network. It was adherent to skin and muscle, but did not infiltrate either.

Left Prescapular Gland.—The left prescapular gland measured 6·3 by 3·2 cm. On section it showed four nodules ; one about 1·3 cm. in diameter consisted of fine translucent tissue with a close caseous network and an occasional gritty streak. The others consisted of collections of caseo-calcareous grains. The rest of the gland substance appeared quite normal.

Right Prescapular Gland.—Normal.

Prepectoral and Axillary Glands.—Normal.

Thorax.

Pleura and Heart.—Normal.

Thoracic Glands.—Normal.

Lungs.—The lungs showed in the margins of the anterior lobes a few small dark collapsed areas ; otherwise they were normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen, Liver, Portal Glands.—Normal.

Kidneys and Suprarenals.—Normal.

Renal, Lumbar, and Iliac Glands.—Normal.

Alimentary Tract.

Tongue, Pharynx, Palate, Tonsils.—Normal.

Submaxillary, Pharyngeal, Parotid, and Hyoid Glands.—Normal.

Intestines.—Normal.

Mesenteric Glands.—Normal.

Testes.—Normal.

Various Lymphatic Glands.

Precrural, Popliteal, Gluteal, Ischiatic, Pudic.—Normal.

Microscopic Examination.

Prescapular Gland.—Moderate number of tubercle bacilli.

CALF 494. Virus A IV.

Subcutaneous inoculation of culture derived from the original material.

Dose—50·0 milligrammes into left side of neck. 1·0 milligramme into right side of neck.

Date of Inoculation—January 29, 1907. [Age about 18 weeks.]

Weight—when killed, 187·29 kilos.

Killed when in good health—July 2, 1907. [154 days after inoculation.]

Temperature.

On the 13th day after inoculation the temperature rose to 39·8° C. and reached a maximum of 40·8° C. on the following day. The temperature remained high for thirteen days ; during the remaining period of the experiment it was normal.

Tuberculin Tests.

April 9, 1907. Dose 2·0 cc. of bovine tuberculin. [70 days after inoculation.] Rise of temperature 0·8° C.

April 30, 1907. Dose 4·0 cc. of avian tuberculin [91 days after inoculation.] Rise of temperature 1·4° C.

June 13, 1907. Dose 4·0 cc. bovine tuberculin. [135 days after inoculation.] Negative reaction. No rise of temperature

POST-MORTEM EXAMINATION.

Condition good.

Local Lesions (I. On the left side of the neck).—In the subcutaneous tissue on the left side of the neck there was a rounded prominent tumour about the size of a hen's egg. On section it consisted of a fibrous walled cyst filled with yellow muco-purulent slightly gritty substance together with a few firmer caseo-necrotic masses; there were several soft caseous tubercles in and between the muscle fibres.

(II. On the right side of the neck).—On the right side of the neck under the skin there was a tumour about the size of a thrush's egg, which on section was a cyst filled with muco-purulent gritty substance.

Left Prescapular Gland.—The left prescapular gland measured 8·1 by 4 by 2·5 cm. On section there was a softening caseo-necrotic gritty mass occupying about half the gland; there was a second smaller similar nodule separated from the former by an isthmus of normal gland substance.

Right Prescapular Gland.—The right prescapular gland measured 7 by 3 by 1·2 cm. It contained in the cortex just beneath the capsule three soft caseous gritty nodules up to a pea in size; the rest of the gland was normal.

Prepectoral, Cervical, and Axillary Glands on both sides were normal.

Thorax.

Pleura.—Normal.

Lungs.—Normal.

Bronchial and Mediastinal Glands.—Normal.

Pericardium and Heart.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Intestines.—Normal.

Mesenteric Glands.—Normal.

Spleen.—Normal.

Liver.—In the liver just beneath the capsule there was a single grey miliary tubercle with a calcareous centre which microscopically showed moderately numerous tubercle bacilli.

Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Renal, Lumbar, and Iliac Glands.—Normal.

Tongue, Larynx, Pharynx, and Tonsils.—Normal.

Various Lymphatic Glands.

Coeliac, Precrural, Gluteal, Popliteal, Parotid, Submaxillary and Retropharyngeal Glands.—Normal.

Microscopical Examination.

(Smear Preparations.)

Left Local Lesion.—Numerous scattered tubercle bacilli and a few small clumps.

Right Prescapular Gland.—Moderately numerous tubercle bacilli.

Right Local Lesion.—A few scattered tubercle bacilli.

Liver Tubercle.—Moderately numerous tubercle bacilli.

Animals Inoculated.

CALF 568. Virus A IV.

Subcutaneous inoculation with culture derived from the Prescapular Gland of Calf 494.

Dose—100·0 milligrammes.

Date of Inoculation—November 9, 1907. [Age about 20 weeks.]

Killed when in good health—May 8, 1908. [181 days after inoculation.]

Clinical History.

There was no sign of ill-health during the experiment.

Temperature.

It rose to 39·7° on the 11th day and remained at this level until the 21st day when it reached 40·1°. After the 29th day it remained normal.

Tuberculin Test.

March 13, 1908. [125 days after the experiment began.] Dose of tuberculin (bovine) 2·0 cc. No reaction.

Weights.

	Kilos.
November 9, 1907	85·25
May 8, 1908	196·81

Total gain in weight.—111·56 kilos.

POST-MORTEM EXAMINATION.

General condition good.

Local Lesion.—At the seat of inoculation in the muscle on the left side of the neck there was a roughly pear-shaped tumour measuring 8 by 6 by 3·5 cm. It was cystic and on section was filled with yellow caseopus.

Left Prescapular Gland.—It measured 6·2 by 2·5 by 1·8 cm. On section it contained two hard nodules measuring about 1 and 2 cm. in diameter, and composed of caseo-calcareous tissue which fairly readily shelled out leaving in the gland substance cavities with somewhat congested walls.

Right Prescapular Gland.—It measured 5·5 by 2·5 by 1·4 cm. and on section was normal.

Lungs.—In the lung there was a nodule the size of a millet seed composed of soft grey translucent tissue. There was no tuberculosis elsewhere.

Microscopical Examination.

(Smear Preparations.)

Local Lesion.—Numerous tubercle bacilli.

Prescapular Gland.—Numerous tubercle bacilli.

Lung (nodule).—No tubercle bacilli.

VIRUS A V. (Spleen of a Pheasant).

CULTURE INOCULATIONS.

July 4, 1906.

Strain derived from original material. Total duration of cultivation, 88 days.

The 4th generation of culture was used, 22 days old.

CALF 458.
Subcutaneous.
Dose : 50·0 mg.
Killed : October 15, 1906.
103 days.

P.M.—Caseo-calcareous and fibroid tumour at seat of inoculation. The left prescapular gland contained two small caseo-calcareous nodules. There was no tuberculosis elsewhere.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
958	Intrav.	0·01 mg.	D. 145 days	Chronic G.T.
959	Intrap.	1·0 mg.	D. 28 ,,	Acute T.
960	Intrap.	0·01 mg.	K. 198 ,,	Chronic G.T.
956	Subcut.	10·0 mg.	D. 52 ,,	Early G.T.
957	Subcut.	10·0 mg.	K. 168 ,,	Chronic G.T.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2127	Intrap.	1·0 mg.	K. 183 days	Local T.
2128	Intrap.	0·01 mg.	K. 182 ,,	No T.
2125	Subcut.	10·0 mg.	D 127 ,,	Local T. T.B. in joint.
2126	Subcut.	10·0 mg.	K. 182 ,,	No T.

CALF 458. Virus A V.

Subcutaneous inoculation of culture derived from the original material.

Dose—50·0 milligrammes.

Date of Inoculation—July 4, 1906.

Weight—51·69 kilos. [Age about 10 weeks.]

Killed when in good general health—October 15, 1906. [103 days after inoculation.]

Clinical Notes.

A small tumour developed at the seat of inoculation on the left side of the neck and the left prescapular gland became slightly enlarged.

On October 12, 100 days after inoculation, the calf was found to be unable to stand on its forelegs. It appeared to be in good health, and its appetite was good.

The animal was killed three days later.

Temperature.

On the 12th day after inoculation the temperature rose, reaching a maximum (40·2° C.) on the 14th day. It remained high for nearly two weeks, returning to the normal on the 25th day. During the remaining period of the experiment it was approximately normal.

Tuberculin Test.

The calf was not tested subsequent to inoculation.

Weights.

	Kilos.
July 4, 1906	51·69
July 17, 1906	58·50
October 15, 1906	87.07

Total gain in weight.—35·38 kilos.

Average rate of gain per week.—2·6 kilos.

POST-MORTEM EXAMINATION.

General condition good.

Local Lesion.—In the subcutaneous tissues on the left side of the neck there was a slightly prominent tumour 6·3 by 4·5 by 1·2 cm. On section it consisted of pinkish translucent tissue containing caseo-calcareous granules and small irregular caseous nodules.

Left Prescapular Gland.—The left prescapular gland was 5 cm. in length and contained (one at each extremity) two nodules, one 0·6 cm. the other 1·2 cm. in diameter, consisting of caseo-calcareous granules.

Right Prescapular Gland, Prepectoral, and Axillary Glands.—Normal.

Thorax.

Pleura and Heart.—Normal.

Lungs and Thoracic Glands.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Spleen.—Normal.

Liver, Gall Bladder, Portal Glands.—Normal.

Kidneys and Suprarenals.—Normal.

Renal, Lumbar, and Iliac Glands.—Normal.

Alimentary Tract.

Tongue, Pharynx, Palate, Tonsils.—Normal.

Pharyngeal, Submaxillary, Hyoid, and Parotid Glands.—Normal.

Intestines.—Normal.

Mesenteric Glands.—Normal.

Joints.—The joints were carefully examined, and were quite normal in appearance.

Various Lymphatic Glands.

Precrural, Popliteal, Gluteal, Ischiatic, Pudic.—Normal.

Microscopic Examination.

Prescapular Gland.—Tubercle bacilli in moderate numbers.

VIRUS A VI. (Spleen of a Pheasant).

CULTURE INOCULATIONS.

SEPTEMBER 21, 1907.

The strain was derived from the original material, and had been in cultivation a total period of 529 days.

The culture used was the 6th generation, 21 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1484	Intrav.	1·0 mg.	D. 12 days	Acute T.
1483	Intrav.	0·1 mg.	D. 43 „	G.T.
1482	Intrav.	0·01 mg.	D. 40 „	G.T.
1485	Intrap.	1·0 mg.	D. 59 „	G.T.
1486	Intrap.	0·1 mg.	D. 85 „	G.T.
1488	Subcut.	50·0 mg.	D. 52 „	G.T.
1487	Subcut.	0·1 mg.	D. 267 „	Chronic G.T.

PARROTS.

Number.	Method.	Dose.	Duration of Life.	Result.
2	Subcut.	10·0 mg.	D. 95 days	G.T.
4	Fed	1·0 mg.	D. 76 „	G.T.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2625	Intrap.	1·0 mg.	D. 56 days	Subacute avian T.
2624	Intrap.	0·1 mg.	D. 57 „	Subacute avian T.
2623	Subcut.	100·0 mg.	K. 171 „	Local T.
2622	Subcut.	50·0 mg.	K. 171 „	Local T.

FOWLS.

Number.	Method.	Dose.	Duration of Life.	Result.
314	Intrap.	0·01 mg.	D. 45 days	G.T.
312	Intrap. (partly sub.).	0·1 mg.	D. 207 „	G.T.
310	Subcut.	1·0 mg.	D. 79 „	G.T.

VIRUS A VII. (Spleen of a Fowl).

CULTURE INOCULATIONS.

I.—March 12, 1907.

The strain was derived from the original material, and had been in cultivation a total period of 112 days.

The culture used was the 4th generation, 21 days old.

PIG 176.

Fed once.
Dose : 50·0 mg.
Killed : Jan. 21, 1908.
315 days.

P.M. — Two submaxillary glands contained two calcareous tubercles each. The majority of the mesenteric glands contained caseo-calcareous nodules. Many of the colic glands contained calcareous granules. The left iliac gland contained caseous and calcareous nodules; two portal glands were slightly affected. Smears from the organs showed no T.B.

GUINEA-PIGS.

Material Inoculated.	Number.	Method.	Duration of Life.	Result.
E. of submaxillary gland.	2963	Intrap.	D. 52 days	No T.
E. of mesenteric gland.	2962	Intrap.	D. 58 ,,	Local T.
E. of iliac gland	2964	Intrap.	D. 40 ,,	No T.

PIG 178.

Fed once.
Dose : 100·0 mg.
Killed when well: June 21, 1907
101 days.

P.M.—In the tonsils were collections of soft yellowish substance, containing T.B. In many of the mesenteric and in the portal glands were yellow streaks and foci, and in the former also two small caseous gritty nodules. There were no visible lesions elsewhere, but T.B. were present, often in large numbers, in all the principal organs, in the intestines, and in all the lymphatic glands examined.

PIG 182.

Intraperitoneal.
Dose : 10·0 mg.
Killed when well: June 26, 1907
106 days.

P.M. — On the peritoneal tissues and the omentum were a few small tubercles and tuberculous patches. The mesenteric glands were enlarged; many contained small yellow foci and streaks occasionally grouped and forming nodules. In the kidneys and spleen grey translucent foci were seen. In the lungs were a very few similar foci The ventral mediastinal glands showed a few calcareous grains. T.B. were numerous in the spleen, liver, kidney and intestines, and in all the lymphatic glands examined.

PIG 180.

Subcutaneous.
Dose : 50·0 mg.
Killed when well· June 25, 1907
105 days.

P.M. — Small cystic local tumour. A left inguinal gland contained softening caseous nodules One or two minute foci were seen in the lungs and kidneys In all the mesenteric glands were caseous streaks and foci, and many were diffusely caseous throughout. In the tonsils were nodules of secretion containing T.B. T.B. were also found in the lung, spleen, liver, and kidneys; very numerous in the intestine and the tuberculous glands

GUINEA-PIGS.

Material Inoculated.	Number	Method.	Duration of Life.	Result.
E. of inguinal gland -	2535	Subcut.	K. 153 days	Local T.
E. of lung - -	2534	Intrap.	K. 153 ,,	No T.
E. of liver - -	2533	Intrap.	K. 153 ,,	Local T.
E. of mesenteric gland	2532	Subcut.	K 153 ,,	Local T.

CAT 96.

Intraperitoneal.
Dose : 1·0 mg.
Died : May 20, 1907.
69 days.

P.M. — Omentum thickened and retracted; composed of grey tissue with a caseous network. Patches of opaque foci on the surfaces of the lungs. No tuberculosis elsewhere.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1278	Intrav.	0·1 mg.	D. 31 days	G.T.
1279	Intrav.	0·01 mg.	D. 43 ,,	G.T.
1280	Intrap.	1·0 mg.	D. 17 ,,	Early G.T.
1281	Subcut.	1·0 mg.	D. 165 ,,	S.T.
1282	Fed.	10·0 mg.	D. 91 ,,	S.T. Local T. severe.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2390	Intrap.	10·0 mg.	D. 17 days	Acute avian T.
2391	Intrap.	1·0 mg.	D. 29 ,,	S.T.
2389	Subcut.	10·0 mg.	D. 37 ,,	Local T.

FOWLS.

Number.	Method	Dose.	Duration of Life.	Result.
216	Intrav	1·0 mg.	D. 33 days	G.T.
218	Intrap.	10·0 mg.	D. 70 ,,	G.T.
220	Subcut.	10·0 mg.	D. 47 ,,	G.T.
222	Subcut.	0·01 mg	D. 183 ,,	G.T.
224	Fed	10·0 mg.	D. 170 ,,	G.T.

RATS.

Number.	Method	Dose	Duration of Life.	Result.
127	Intrap.	20·0 mg.	K. 82 days	G.T. Numerous T.B. in organs.
125	Intrap	1·0 mg.	K 177 ,,	Local T. T.B. in organs.
124	Intrap.	0·1 mg.	K. 173 ,,	No T. T.B. in liver and spleen
123	Intrap.	0·01 mg.	K 574 ,,	Local T. T.B. in lung and spleen
128	Subcut	20·0 mg.	K. 244 ,,	No T. T.B in spleen.

VIRUS A VII. (Spleen of a Fowl).

CULTURE INOCULATIONS.

II.—January 24, 1908.

The strain was derived from the original material, and had been in cultivation a total period of 430 days.

The culture used was the 8th generation, 21 days old.

PONY 10.

Subcutaneous.

Dose : 100·0 mg.

Died : March 2, 1908.

38 days.

P.M.—Fibrous walled cyst at seat of inoculation; necrotic patches in two left prescapular glands. Death from septic peritonitis and pyaemia

GOAT 54.

Subcutaneous.

Dose : 50·0 mg.

Killed : May 22, 1908

119 days.

P.M.—Cyst with caseo necrotic contents at seat of inoculation. Caseo-necrotic nodules in adjacent glands. In one mesenteric gland numerous softened caseous gritty collections were seen. A left iliac gland contained four yellow tubercles.

GUINEA-PIGS.

Material Inoculated.	Number.	Method.	Duration of Life.	Result.
E. of local lesion.	3190	Subcut.	K. 103 days	Local T.
E. of prescapular gland.	3189	Subcut	K. 103 „	Local T.
E. of cervical gland.	3192	Subcut.	K. 103 „	Healthy.
E. of mesenteric gland.	3191	Subcut.	K. 103 „	Healthy.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1603	Intrav.	1·0 mg.	D. 47 days	G.T.
1602	Intrav.	0·1 mg.	D. 33 „	G.T.

March 11, 1908.

PIG 246.

Fed with emulsion of lung, liver, spleen, and kidneys from Rabbit 1603.

Killed : June 12, 1908.

93 days.

P.M.—All the mesenteric and colic glands contained caseous gritty nodules, some confluent. On the surface of the lungs there were three or four translucent tubercles and a group of minute foci. There was no tuberculosis elsewhere.

GUINEA-PIGS.

Material Inoculated.	Number.	Method.	Duration of Life.	Result.
E. of mesenteric gland (*a*).	3198	Intrap.	K. 103 days	Local T.
	3197	Subcut.	K. 103 „	Local T.
E. of mesenteric gland (*b*).	3199	Intrap.	K. 103 „	Healthy.

PIG 176. Virus A VII.

Fed once with culture derived from the original material.

Dose—50·0 milligrammes.

Date of Feeding—March 12, 1907. [Age 8 weeks.]

Killed when in good health—January 21, 1908. [315 days after the experiment began.]

Clinical History.

There was no sign of ill-health during the experiment.

Temperature.

Normal throughout.

Tuberculin Tests.

June 13, 1907. [93 days after the experiment began.] Dose of tuberculin 4·0 cc. Rise of temperature 1·3° C.

September 18, 1907. [190 days after the experiment began.] Dose of tuberculin 2·0 cc. Rise of temperature 2·3° C.

October 29, 1907. [231 days after the experiment began.] Dose of tuberculin 4·0 cc. Rise of temperature 0·8° C.

Weights.

	Kilos.
March 12, 1907	9·97
January 21, 1908	65·75

Total gain in weight—55·78 kilos.

POST-MORTEM EXAMINATION.

General condition good.

Submaxillary Glands.—In the largest submaxillary gland on each side there were two calcareous tubercles the size of rape seed, just beneath the capsule. There was also a gritty granule in the left gland.

Intestines.—Normal.

Mesenteric Glands.—The majority of the mesenteric glands contained irregular caseo-calcareous nodules easily shelling out of the substance; several of the glands were considerably replaced. The remaining glands were normal.

Colic Glands.—Many of the colic glands contained calcareous granules.

Portal Glands.—Normal in size. In each of two there was a single minute calcareous granule.

Iliac Glands.—The left iliac gland contained about six irregular soft caseous and calcareous nodules up to a hemp seed in size. The central gland contained three similar nodules.

All organs and other lymphatic glands were normal.

Microscopical Examinations.

(Smear Preparations.)

Portal Gland (focus).—One beaded tubercle bacillus.

Mesenteric Gland.—Moderately numerous tubercle bacilli.

There were no tubercle bacilli seen in smears from the lung, liver, spleen, kidney, and iliac gland.

No growth was obtained in cultures made from the mesenteric, submaxillary, and iliac glands.

PIG 178. Virus A VII.

Fed once with culture derived from the original material.

Dose—100·0 milligrammes.

Date of Feeding—March 12, 1907. [Age 8 weeks.]

Killed when in good health—June 21, 1907. [101 days after feeding.]

Clinical History.

The animal remained in good health throughout the experiment.

Temperature.

Approximately normal throughout.

Tuberculin Test.

93 days after feeding. Reaction negative.

Weights.

	Kilos.
March 12, 1907	9·97
June 21, 1907	17·68

Total gain of weight—7·71 kilos.

POST-MORTEM EXAMINATION.

General Condition.—Animal appeared well; it was fat and in good condition.

Tongue, Larynx, Pharynx and Trachea.—Normal.

Tonsils.—In each tonsil there were several small collections of soft yellowish substance. (? secretion.)

Submaxillary Glands.—Normal.

Cervical Glands.—Normal.

Intestines.—The large and small intestines, except for slight congestion, appeared normal.

Mesenteric Glands.—Many of the mesenteric glands showed fine yellowish markings between the lobules, an appearance sometimes present in normal glands of the pig. In addition there were also two small linear caseous gritty nodules up to nearly 2 mm. in length.

Spleen.—Normal.

Liver.—Normal.

Portal Glands.—In the portal glands there were streaks and foci similar to those in the mesenteric glands.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Lumbar and Iliac Glands.—Normal.

Thorax.

Lungs.—The lungs were irregular and patchily congested, and a little oedematous.

Heart.—Normal.

Bronchial and Mesenteric Glands.—These appeared normal.

Various Lymphatic Glands.

Parotid, Prescapular, Precrural, Inguinal, and Popliteal Glands.—Normal.

Microscopical Examinations.

(Smear Preparations.)

Spleen (substance).—Tubercle bacilli moderately numerous.

Liver (substance).—Tubercle bacilli present in large numbers.

Kidney (substance).—Tubercle bacilli scanty.

Lung (substance).—Tubercle bacilli in clumps.

Bronchial Gland (substance).—Very numerous tubercle bacilli.

Portal Glands (streaks).—Numerous tubercle bacilli.

Coeliac Gland (streaks).—Numerous tubercle bacilli.

Mesenteric Gland (streaks).—Swarms of tubercle bacilli.

Mesenteric Gland (nodule).—Swarms of tubercle bacilli.

Intestine (scraping).—Very numerous tubercle bacilli.

Tonsil (pus).—A moderate number of tubercle bacilli.

PIG 180. Virus A VII.

Subcutaneous inoculation of culture derived from the original material.

Dose—50·0 milligrammes.

Date of Inoculation—March 12, 1907. [Age 8 weeks.]

Killed when in good health—June 25, 1907. [105 days after inoculation.]

Clinical History.

During the whole experiment the animal showed no symptoms of ill-health.

Temperature.

Approximately normal throughout.

Tuberculin Test.

93 days after inoculation. Reaction negative.

Weights.

	Kilos.
March 12, 1907	7·25
June 25, 1907	13·24

Total gain in weight—5·99 kilos.

POST-MORTEM EXAMINATION.

General condition.—The animal was in fair condition but had not grown much.

Local Lesion.—In the subcutaneous tissue at the seat of inoculation in the abdominal wall there was a circular nodule 3 cm. in diameter by 1·3 cm. in thickness. On section it was a fibrous cyst with smooth internal walls and filled with bright yellow pus.

Inguinal Glands.—The left inguinal gland was enlarged and contained at one extremity a collection of caseous slightly gritty nodules softening at their periphery and capable of being picked out though not very easily. They replaced about half of the gland. A second gland showed foci of congestion only.

Left Sternal Gland.—The left sternal gland was enlarged and showed at one extremity some discrete irregular caseous and gritty nodules mostly about the size of rape seed.

Right Inguinal and Right Sternal Glands.—Normal.

Precrural Glands.—Normal.

Axillary Glands.—Normal.

Thorax.

Lungs.—The lungs were pink in colour and collapsed well. The substance was beset with small congested foci; one minute translucent focus was also seen.

Bronchial Glands.—Normal.

Mediastinal Glands.—Normal.

Abdomen.

Intestines.—The intestines appeared normal.

Mesenteric Glands.—In the cortices of some of the mesenteric glands there were numerous yellowish softening caseous slightly gritty streaks and irregular foci; other glands were enlarged and firm, containing either a network of waxy caseous tissue, or diffusely caseous nodules opaque and softened in parts and not easily separated from the surrounding gland substance.

Spleen.—Normal.

Liver.—Normal.

Portal Glands.—Normal.

Kidneys.—On the surfaces of the kidneys just beneath the capsules an occasional grey point could be seen.

Suprarenal Bodies.—Normal.

Lumbar and Iliac Lymphatic Glands.—Normal.

Tongue, Larynx, and Pharynx.—Normal.

Tonsils.—In the tonsils there were yellowish nodules of secretion.

Various Lymphatic Glands.

Submaxillary, Parotid, Pharyngeal, Cervical, Prescapular, and Popliteal Glands.—Normal.

Microscopical Examinations.

(Smear Preparations.)

Lung (substance).—A few tubercle bacilli.

Spleen (substance).—A few tubercle bacilli.

Liver (substance).—More numerous tubercle bacilli.

Kidney (substance).—A few tubercle bacilli.

Local Lesion.—Moderately numerous tubercle bacilli.

Inguinal Gland (emulsion).—Swarms of tubercle bacilli.

Mesenteric Gland (substance).—Large numbers of tubercle bacilli.

Intestine (scraping).—Very numerous tubercle bacilli.

Stomach (scraping).—No tubercle bacilli seen.

Tonsil (secretion).—A few tubercle bacilli.

PIG 182. Virus A VII.

Intraperitoneal inoculation of culture derived from the original material

Dose—10·0 milligrammes.

Date of Inoculation—March 12, 1907. [Age 8 weeks.]

Killed in good health—June 26, 1907. [106 days after inoculation.]

Clinical History.

There were no signs of illness during the experiment.

Temperature.

Approximately normal throughout

Tuberculin Test.

93 days after inoculation. Reaction negative.

Weights.

	Kilos.
March 12, 1907	10·90
June 26, 1907	18·56

Total gain in weight.—7·66 kilos.

POST-MORTEM EXAMINATION.

General condition good.

Abdomen.

Parietal Peritoneum.—The parietal peritoneum was not affected.

Omentum.—The omentum was not thickened or retracted, but it showed moderately numerous discrete translucent streaks and small patches. The majority of these were flat without any thickness, but there were scattered firm nodules, mainly in the free margin, which attained the size of a wheat grain, and showed central opacities consisting either of soft yellow slightly gritty substance or irregular calcareous grains.

Meso-colon.—On the mesentery of the large intestine there were sparsely scattered nodules up to 7 by 5 mm., sometimes composed wholly of translucent tissue and only occasionally showing yellow gritty foci in the centre.

Mesentery.—The central part of the mesentery appeared normal, but near the mesenteric glands it showed radial translucent thickenings beset with opaque foci.

Intestines.—Small intestine. The epithelium lining the small intestine was pale. The large intestine appeared normal.

Coeliac Glands.—The glands situated dorsally to the stomach, near the cardiac orifice,appeared enlarged, but showed no obvious tuberculous change.

Mesenteric Glands.—The mesenteric glands were uniformly enlarged ; on section in some the substance appeared normal, but in the majority could be seen numerous minute yellowish streaks and foci ; in others these had run together and formed small irregular caseous slightly gritty nodules.

Spleen.—The lymphatic fringes on the spleen were a little enlarged ; in the substance greyish translucent foci were visible.

Liver.—The liver appeared normal.

Portal Glands.—The portal glands were enlarged but showed no opacities.

Kidneys.—In the cortices of the kidneys there were numerous irregular grey translucent foci.

Suprarenal Bodies.—These appeared normal.

Lumbar Lymphatic Glands.—These glands were a little enlarged.

Iliac Lymphatic Glands.—Normal.

Diaphragm.—On the peritoneal surface of the diaphragm there was a yellowish calcareous submiliary tubercle.

Thorax.

Lungs.—On the surface of the right caudal lobe just beneath the pleura there was a grey miliary tubercle. In the rest of the lung there was an occasional translucent focus.

Thoracic Glands.—The bronchial glands appeared normal.

The Dorsal Mediastinal Glands were normal.

The Ventral Mediastinal Glands were enlarged and firm, and showed a few sparsely scattered yellowish calcareous grains.

Various Lymphatic Glands.

Submaxillary, Parotid, Cervical, Prescapular, Axillary, Precrural, Inguinal, and Popliteal Glands.—Normal.

Microscopical Examinations.

(Smear Preparations.)

Spleen (substance).—Tubercle bacilli moderately numerous.

Liver (substance).—Tubercle bacilli numerous.

Kidney (substance).—No tubercle bacilli seen.

Small Intestine (scraping).—Tubercle bacilli in large numbers.

Large Intestine (scraping). — Tubercle bacilli numerous.

Mesenteric Gland (substance).—Swarming with tubercle bacilli.

Mesenteric Gland (nodule).—Swarming with tubercle bacilli.

Portal Gland (substance).—Moderately numerous tubercle bacilli.

Coeliac Gland (substance).—Swarming with tubercle bacilli.

CAT 96. Virus A VII.

Intraperitoneal inoculation of culture from the original material.

Dose—1·0 milligramme.

Date—March 12, 1907.

Died—May 20, 1907. [69 days after inoculation.]

Weights.

	grammes.
March 12, 1907	1650
May 20, 1907	1300

Loss.—350 grammes.

POST-MORTEM EXAMINATION.

Omentum.—The omentum was thickened, retracted and adherent to the spleen ; it consisted of firm translucent tissue with a caseous network.

The Mesentery and Parietal Peritoneum were normal.

Lungs.—The lungs were oedematous and showed on the surfaces numerous greyish white patches, small and irregular and made up of collections of opaque foci.

Other organs and glands appeared normal.

Microscopical Examinations.

One tubercle bacillus was seen in a smear made from a caseous patch of the lung ; none in the spleen, liver, and kidney.

PONY 10. Virus A VII.

Subcutaneous inoculation of culture derived from the original material.

Dose—100·0 milligrammes.

Date of Inoculation—January 24, 1908. [Age about 1 year.]

Died—March 2, 1908. [38 days after inoculation.]

Clinical History.

The animal appeared well until a few days before its death. It then became quiet and was always lying down.

Death was due to acute septic peritonitis, the cause of which could not be discovered.

A small raised tumour had developed at the seat of inoculation but the skin remained unbroken.

Temperature.

Normal.

Weights.

	Kilos.
January 24, 1908	103·40
March 2, 1908	84·35

Total loss in weight.—19·05 kilos.

POST-MORTEM EXAMINATION.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a circular tumour 4 by 1·5 cm. which on section was a fibrous walled cyst with a central cavity containing reddish necrotic masses and serous fluid. The skin over it had not broken but it was thinned and dead.

Left Prescapular Glands.—In the left group of prescapular glands there was one about 1·2 cm. in greatest length which was about half replaced by firm bright yellow necrotic substance ; in a second there was a small necrotic patch. All the other glands were normal.

Left Cervical Glands.—A left cervical gland contained a few minute calcareous grains.

Thorax.

Lungs.—In the lungs there were sparsely scattered nodules, similar to those in the liver, which were distinctly palpable and varied up to nearly a millet seed in size. The lung parenchyma was pink and crepitant.

Bronchial Glands.—Normal.

Abdomen.

Peritoneal Cavity.—The peritoneal cavity was filled with turbid fluid and there was a deposit of yellowish fibrin on the intestines which were glued together. The mesentery was contracted.

Spleen.—Normal.

Liver.—In the liver there were moderately numerous nodules up to nearly a millet seed in size. They were very irregularly distributed and about half the right lobe was unaffected. They were composed of soft grey tissue with a yellowish tint.

Kidneys.—Normal.

Intestines.—The walls of the intestines were thickened with inflammatory exudation. There was no sign of any perforation.

The Mesenteric, Colic, Rectal and Ventral Mediastinal Glands were enlarged and contained necrotic patches becoming purulent.

Other lymphatic glands were normal.

Microscopical Examinations.

(Smear Preparations.)

Local Lesion.—Very numerous tubercle bacilli.

Left Prescapular.—Very numerous tubercle bacilli.

Left Cervical.— One tubercle bacillus : other organisms present.

Peritoneal Fluid. — Swarms of blue-staining organisms.

Liver Nodules.—Blue-staining organisms.

Note.—The tuberculosis was limited to the seat of inoculation and the nearest lymphatic glands. Death was due to acute septic peritonitis and pyaemia.

GOAT 54. Virus A VII.

Subcutaneous inoculation of culture derived from the original material.

Dose—50·0 milligrammes.

Date of Inoculation—January 24, 1908. [Age 5 months.]

Killed when in good health—May 22, 1908. [119 days after inoculation.]

Clinical History.

The animal showed no sign of ill-health during the experiment.

Temperature.

Normal throughout.

Tuberculin Tests.

March 13, 1908. [49 days after the experiment began.] Dose of tuberculin (Bovine), 2·0 cc. Rise of temperature, 1·4° C.

May 13, 1908. [110 days after the experiment began.] Dose of tuberculin, 2·0 cc. (Avian). Rise of temperature, 2·2° C.

POST-MORTEM EXAMINATION.

General condition good.

Local Lesion.—In the subcutaneous tissue on the left side of the neck there was a prominent rounded tumour about 7 cm. in diameter. In the underlying muscles there were numerous small nodules filled with caseous substance. On section the tumour consisted of a thick fibrous walled cyst filled with softening caseo-necrotic substance.

Prescapular Glands.—The left prescapular gland measured 5·5 by 3 by 2 cm. On section it contained two softening caseo-necrotic nodules almost replacing the gland substance, the largest measuring 3 by 2·5 cm.

The right prescapular gland measured 3·6 by 1·7 by 0·7 cm. On section it was normal.

Prepectoral Glands.—Normal.

Cervical Glands.—A left cervical gland, a little larger than a sparrow's egg, was replaced by pinkish softening caseo-necrotic substance.

A second gland contained a caseous gritty nodule 6 mm. in diameter.

In a third smaller gland there were several small caseo-calcareous nodules.

Axillary Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—Normal.

Bronchial and Mediastinal Glands.—Normal.

Heart.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Intestines.—Normal.

Mesenteric Glands.—In one mesenteric gland there were numerous softened yellow collections of caseous gritty substance.

Spleen.—Normal.

Liver.—Normal.

Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Iliac Glands.—A left iliac gland contained four yellow tubercles.

Renal, Coeliac, and Lumbar Glands.—Normal.

Tongue, Tonsils, Larynx, and Pharynx.—Normal.

Various Lymphatic Glands.

Parotid, Submaxillary, Retro-pharyngeal, Precrural, and Popliteal Glands.—Normal.

Microscopical Examinations.

(Smear Preparations.)

Local Lesion.—Numerous tubercle bacilli.

Prescapular Gland.—Numerous tubercle bacilli.

Lung.—No tubercle bacilli.

Liver.—No tubercle bacilli.

Left Iliac Gland.—No tubercle bacilli.

Mesenteric Gland.—A few scattered tubercle bacilli.

PIG 246. Virus A VII.

Fed with the organs of Rabbit 1603 (which had been inoculated intraveneously with 1·0 mg. of culture of the original material).

Date of Feeding—March 11, 1908. [Age 15 weeks.]

Killed in good health—June 12, 1908. [93 days after feeding.]

Temperature.

Normal throughout.

Tuberculin Test.

May 13, 1908. [63 days after the experiment began.] Dose of tuberculin, 2·0 cc. No reaction.

Weights.

		Kilos.
March 11, 1908	... ...	27·66
June 12, 1908	... ...	43·08

Gain in weight.—15·42 kilos.

POST-MORTEM EXAMINATION.

Condition good.

Tongue, Tonsils, Pharynx, Submaxillary Glands and Intestines.—Normal.

Mesenteric Glands.—All the mesenteric glands contained yellow caseous nodules with a few gritty streaks. Most of the nodules were firm except round the margins which were softening a little, and which could be separated from the surrounding gland tissue. In several of the glands the nodules were closely placed and confluent replacing the majority of the superficial part of the cortices of the gland.

Colic Glands.—They resembled the mesenteric.

Lungs.—On the surface of the lungs there was a small collection of transparent foci and three or four minute transparent tubercles.

All other organs and glands were normal.

Animal Inoculations.

Three guinea-pigs were inoculated with emulsions of the mesenteric glands ; two developed local tuberculosis only, the third remained healthy.

Microscopical Examinations.

(Smear Preparations.)

Lung (substance).—No tubercle bacilli.

Liver (substance).—No tubercle bacilli.

Spleen (substance).—No tubercle bacilli.

Intestine (scraping).—No tubercle bacilli.

Lung (tubercle).—No tubercle bacilli.

Mesenteric Gland.—Numerous tubercle bacilli.

VIRUS A VIII. (Spleen of a Fowl).

CULTURE INOCULATIONS.

I.—May 28, 1907.

The strain was derived from the original material, and had been in cultivation a total period of 186 days.

The culture used was the 4th generation, 21 days old.

CALF 524.

Intravenous.

Dose : 200·0 mg.

Died : June 27, 1907.

30 days.

P.M.—The lungs were almost entirely consolidated and airless, and showed patches of caseation everywhere. T.B. were numerous in all the principal organs, in the small intestine, and in all the glands examined.

CALF 544.

Intravenous.

Dose : 10·0 mg.

Died : June 30, 1907.

33 days.

P.M.—The greater portion of the lung substance was solid and airless; the right anterior lobe was closely beset with early caseous patches. T.B. were numerous in the lung, liver, spleen, and scanty in a scraping from the intestine.

GUINEA-PIGS.

Material Inoculated.	Number.	Method.	Duration of Life.	Result.
E. of lung (*b*)	2541	Intrap.	K. 154 days	Local T.
E. of lung (*a*)	2539	Subcut.	K. 154 ,,	Local T.
	2540	Subcut.	K. 154 ,,	Local T.

DOGS (Puppies).

Number.	Method.	Dose.	Duration of Life.	Result.
152	Intrav	more than 1·0 mg.	K. 194 days	No T.
154	Intrav.	10·0 mg.	K. 171 ,	No. T.

RABBITS.

Number	Method.	Dose.	Duration of Life.	Result.
1352	Intrav.	10·0 mg.	D. 22 days	G. T.
1353	Intrav.	1·0 mg.	D. 22 ,,	G. T.
1354	Intrav.	1 0 mg.	D. 25 ,,	G. T.
1351	Intrap.	1·0 mg.	D. 22 ,,	Early G. T.
1350	Subcut.	0·01 mg.	D. 153 ,,	Chronic G. T.
1349	Subcut.	0·0001 mg.	K. (dying) 258 days.	Chronic G. T.
1348	Subcut.	0·0000001 mg.	K. 305 days	No T.

June 19, 1907.

RAT 136.

Fed.

Emulsion of organs from Rabbit 1353.

Died : 152 days.

P.M.—No tuberculosis.

FOWLS.

Emulsion of Organs from Rabbits 1351 and 1352.

Number.	Method.	Duration of Life	Result.
266	Fed	K. 70 days	G. T. moderately severe.
268	Fed	K. 154 ,,	Ditto.
270	Fed	K. 98 ,,	Ditto
272	Fed	K. 126 ,,	G. T. Local T. severe.
274	Fed	D. 173 ,,	G. T. severe.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2505	Intrap.	100·0 mg.	D. 29 days	Acute avian T.
2506	Intrap.	10·0 mg.	D. 9 .	
2503	Intrap.	1·0 mg.	D. 52 ,,	Subacute avian T.
2504	Subcut.	100·0 mg.	K. 149 ,,	Scar in skin.

RATS.

Number.	Method.	Dose	Duration of Life.	Result
132	Intrap.	200·0 mg	D. 131 days	G.T. Numerous T.B. in organs
133	Intrap	1·0 mg.	K. 497 ,,	Local T. severe. A few T.B in organs.

FOWLS.

Number.	Method.	Dose	Duration of Life	Result.
252	Subcut.	1·0 mg.	K. 254 days	G. T.
250	Subcut.	0·01 mg.	K. 254 ,,	G. T.
248	Subcut.	0·0001 mg.	D. 190 ,,	G. T.
246	Subcut.	0·000001 mg.	K. 254 ,,	G. T.
244	Subcut.	0·0000001 mg.	K. 254 ,,	Slight G. T.

II.—August 15, 1907.

The strain was derived from the original material, and had been in cultivation a total period of 265 days.

The culture used was the 6th generation, 21 days old.

HORSE 2 (Pony).

Subcutaneous.

Dose : 50·0 mg.

Killed : Jan. 20, 1908.

158 days.

P.M.—Small local ulcer. Two left prescapular glands contained each a large waxy caseous nodule. In the lungs there were three nodules, two translucent, one with opaque foci. The omentum contained a fibro-calcareous nodule.

HORSE 4 (Pony).

Fed once.

Dose : 100 0 mg.

Killed : Jan. 22, 1908.

160 days.

P.M.—Two minute opaque foci were seen in the small intestine, and an opaque focus in one mesenteric gland. There was no tuberculosis elsewhere.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2595	Subcut.	50·0 mg.	K. 163 days	Local T.
2596	Subcut.	50·0 mg.	D. 61 ,,	Local T.
2597	Subcut.	50·0 mg.	K. 163 ,,	Local T.

VIRUS A VIII. (Spleen of a Fowl).

CULTURE INOCULATIONS.

III.—April 7, 1908.

The strain was derived from the original material, and had been in cultivation a total period of 501 days.

The culture used was the 8th generation, 22 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1717	Intrav.	0·00001 mg.	D. 100 days	Chronic T. (not severe).
1721	Intrav.	0·0000001 mg.	D. 198 „	Chronic T.

PIG 248.

Intravenous.

Dose : 50·0 mg.

Died : May 24, 1908.

47 days.

P.M.—Acute tuberculosis.

PARROT 18.

Fed : About 20·0 mg.

Died 113 days.

P.M.—Lungs almost replaced by caseonecrotic masses. Caseous patches and foci in the liver ; a few foci in the spleen. The culture had evidently been inhaled.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
3141	Intrap.	1·0 mg.	D. 50 days	Subacute avian T.
3142	Intrap.	1·0 mg.	D. 36 „	

FOWLS.

Number.	Method.	Dose.	Duration of Life.	Result.
376	Intrav.	0·00001 mg.	K. 94 days	G.T. severe.
378	Intrav.	0·000001 mg.	K. 94 „	G.T. moderately severe.
380	Intrav.	0·0000001 mg.	K. 94 „	G.T. slight.

CALF 524. Virus A VIII.

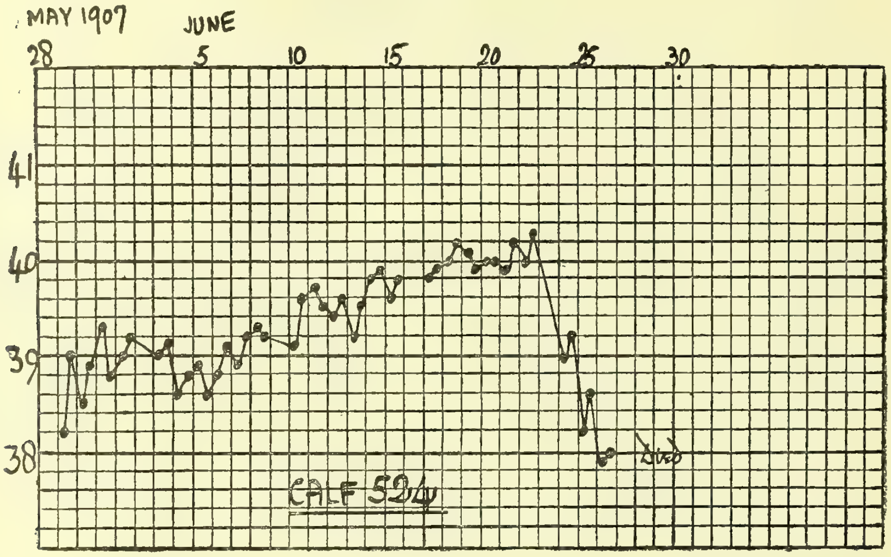
Intravenous inoculation of culture derived from the original material.

Dose—200·0 milligrammes.

Date of Inoculation—May 28, 1907. [Age 14 weeks.]

Died—June 27, 1907. [30 days after inoculation.]

Temperature.



Weights.

	Kilos.
May 28, 1907	31·75
June 27, 1907	26·75

Total loss in weight.—5·0 kilos.

POST-MORTEM EXAMINATION.

Condition poor.

Local Lesion.—Along the vein of the ear there was some thickening surrounded by a collection of muco-pus, and in the corresponding parotid gland there were a few caseous patches.

Thorax.

Pleura.—The pleura appeared normal.

Lungs.—The anterior, the middle, and a considerable part of the ventral portions of the posterior lobes were dark reddish grey and airless. In the remaining portions of the posterior lobes containing air, there were scattered congested lobules. The dark red anterior lobes were mottled with numerous yellowish patches and small grey nodules. In some parts the caseous patches were extensive, replacing a number of lobules; similarly in the rest of the solid areas there was extensive caseation of the pneumonic parts. Muco-pus could be expressed from the bronchioles, and the larger bronchi also contained pus.

Thoracic Glands.—The bronchial and mediastinal glands did not appear enlarged; they were congested and oedematous but showed no caseation except for two small yellowish tubercles.

The sternal glands and the glands at the entrance to the thorax were congested.

Heart and Pericardium.—Normal.

Abdomen.

Peritoneum, Omentum, and Diaphragm—Normal.

Intestines.—Normal.

Mesenteric Glands.—Normal.

Spleen.—The spleen weighed 254 grammes; it was somewhat enlarged and swollen, and on section the substance was dark red with a tendency to be diffluent.

Liver.—The surface of the liver appeared normal; on section grey points and streaks could be seen, probably interlobular connective tissue.

Portal Glands.—In a portal gland there was an undefined small yellowish patch.

Kidneys.—The cortices of both kidneys were pale

Suprarenal Bodies.—Normal.

Lumbar, Renal, and Iliac Lymphatic Glands.—These glands were uniformly enlarged and oedematous.

Left Prescapular, Prepectoral, Inferior Cervical, and Axillary Glands.—All were congested, several being dark red.

Left Superior Cervical and Submaxillary Glands.—These glands were a little oedematous. The corresponding glands on the right side resembled those on the left side.

Precrural, Popliteal, Ischiatic, and Gluteal Glands.—These appeared normal.

In none of the lymphatic glands, except the parotid, was there any caseation.

Microscopical Examinations.

(Smear Preparations.)

Lung (substance).—Numerous tubercle bacilli.

Liver (substance).—Very numerous scattered tubercle bacilli and some small clumps.

Spleen (substance).—Very numerous tubercle bacilli.

Kidney (substance).—Moderately numerous tubercle bacilli.

Popliteal Gland (substance).—Numerous tubercle bacilli.

Mesenteric Gland (substance).—Very numerous tubercle bacilli.

Small Intestine (scraping).—Very numerous tubercle bacilli.

CALF 544. Virus A VIII.

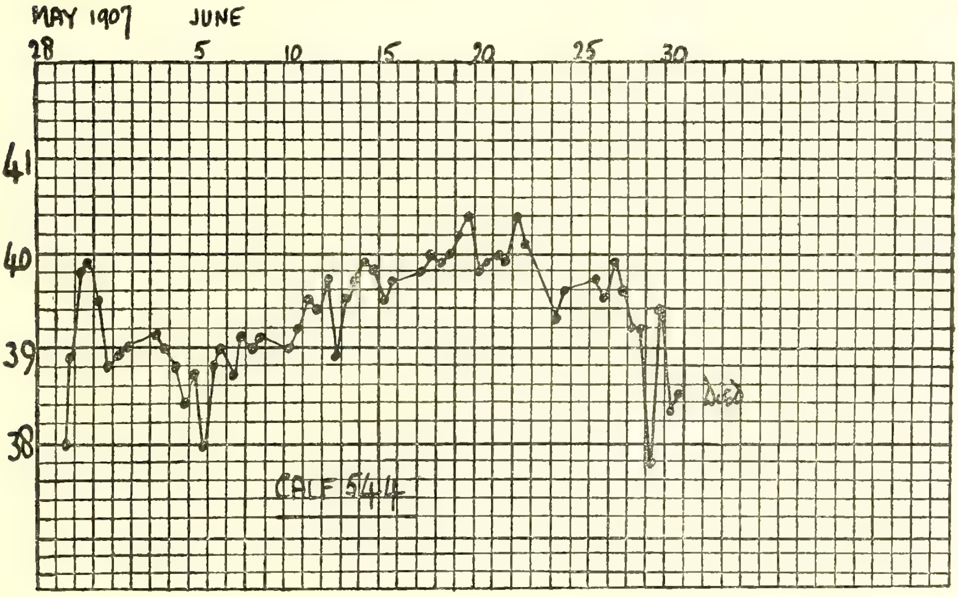
Intravenous inoculation of culture derived from the original material.

Dose—10·0 milligrammes.

Date of Inoculation—May 28, 1907. [Age 6½ weeks.]

Died—June 30, 1907. [33 days after inoculation.]

Temperature.



Weights.

	Kilos.
May 28, 1907	35·38
June 30, 1907	31·29

Total loss in weight.—4·09 kilos.

POST-MORTEM EXAMINATION.

Condition poor.

Thorax.

Pleura.—Normal.

The pleural cavities contained a small amount of fluid.

Lungs. — The left anterior and antero-inferior portions of the caudal lobes were dark red, solid and airless. They showed a few collections of small greyish patches. The rest of the caudal lobe was beset with pneumonic nodules. The corresponding parts of the right lung, including the middle lobe, were in a similar condition of red hepatisation, but in the anterior lobe the substance was closely beset with greyish early caseous patches.

Thoracic Glands.—The bronchial and mediastinal glands were congested and oedematous.

Pericardium and Heart.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Intestines.—The intestines appeared normal.

Mesenteric Glands.—These glands were not enlarged and appeared normal.

Spleen.—The spleen weighed 509 grammes ; it was considerably enlarged and firm in consistency. On section the splenic pulp was dark red, but otherwise normal in appearance.

Liver.—The interlobular network of the liver was prominent.

Portal Glands.—In the portal glands there were some scattered small discrete slightly yellow patches.

Kidneys.—The kidneys appeared normal. On section the pelves were oedematous.

Tongue, Tonsils, Larynx, and Pharynx.—Normal.

The Subcutaneous Tissues of the body and the extraperitoneal tissue were oedematous.

Various Lymphatic Glands.

Parotid, Submaxillary, Cervical, Prescapular, Prepectoral, Axillary, Precrural, Popliteal, Gluteal, Ischiatic, Coeliac, Lumbar, and Iliac Glands.—All were odematous with varying amounts of congestion, but showed no caseation.

Microscopical Examinations.

(Smear Preparations.)

Liver (substance).—Tubercle bacilli numerous.

Lung (substance).—Tubercle bacilli numerous, but not so numerous as in the liver.

Spleen (substance).—Tubercle bacilli numerous, but not so numerous as in the liver.

Intestine (scraping).—Tubercle bacilli scanty.

DOG 152 (Puppy). Virus A VIII.

Intravenous inoculation of culture derived from the original material.

Dose—1·0 milligramme.

Date—May 28, 1907.

Killed—December 8, 1907. [194 days after inoculation.]

Weight—3200 grammes.

Tuberculin Tests.

September 18, 1907. [113 days after the experiment began.] Dose of tuberculin (bovine) 4·0 cc. No reaction.

October 29, 1907. [154 days after the experiment began.] Dose of tuberculin (avian) 4·0 cc. No reaction.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Liver.—In the liver there were two small grey nodules composed of soft translucent tissue.

There was no sign of tuberculosis elsewhere.

Microscopical Examination of smears made from the lungs, liver, and spleen showed no tubercle bacilli.

DOG 154 (Puppy). Virus A VIII.

Intravenous inoculation of culture derived from the original material.

Dose—10·0 milligrammes.

Date—May 28, 1907.

Killed—November 15, 1907. [171 days after inoculation.]

Weight—Initial: 3530 grammes. Final: 10,400 grammes.

Tuberculin Tests.

September 18, 1907. [113 days after the experiment began.] Dose of tuberculin (bovine) 4·0 cc. No reaction.

October 29, 1907. [154 days after the experiment began.] Dose of tuberculin (avian) 4·0 cc. No reaction.

POST-MORTEM EXAMINATION.

Carcass in good condition.

The animal was perfectly healthy and showed no trace of the inoculation.

PONY 2 (Aged). Virus A VIII.

Subcutaneous inoculation with culture derived from the original material.

Dose—50·0 milligrammes.

Date of Inoculation—August 15, 1907.

Killed when in good health—January 20, 1908. [158 days after the experiment began.]

Clinical History.

A small rounded prominent tumour was formed by the inoculation of 10 cc. of emulsion. This flattened out and 24 hours later was a soft flattened but slightly raised tumour 8 by 10 cm. The tumour became more prominent, tense, and fluctuating. A small hole formed six days after inoculation. The ulcer became larger and discharged.

Temperature.

Normal.

Tuberculin Test.

October 29, 1907. [75 days after the experiment began.] Dose of tuberculin (avian) 4·0 cc. Rise of temperature 2·3° C.

Weights.

	Kilos.
August 15, 1907	334·68
January 20, 1908	365·62

Total gain in weight.—30 84 kilos.

POST-MORTEM EXAMINATION.

General condition good.

Local Lesion.—In the skin at the seat of inoculation on the left side of the neck there was an ulcer covered with red granulations and measuring 2·0 by 0·5 cm.; the edges were smooth and turned in. On section through it there was found in the deeper layers of the skin a number of yellowish fairly firm caseous nodules.

Prescapular Glands.—Left prescapular glands. Two of the glands in the prescapular group were firm, the largest the size of a sparrow's egg; this contained a firm yellowish waxy caseous nodule easily shelling out and replacing nearly half the substance; the second gland was smaller but similarly affected.

The right prescapular glands were normal.

Cervical Glands.—Normal.

Thorax.

Lungs.—In the lungs there was a firm grey translucent patch 1 cm. in length beset with opaque foci (nodule I). There was a second circular nodule 1·2 cm. in diameter slightly raised on the pleural surface which on section was perfectly translucent. There was a third small nodule slightly opaque in the centre.

Abdomen.

In the omentum there was a firm fibrous nodule containing in the centre brownish yellow calcareous substance.

There was a mass of yellowish grey necrotic substance around and infiltrating the vessels in one part of the mesentery (parasitic).

Liver.—The liver contained, scattered deeply in its substance, four or five collections of calcareous granules enclosed in firm fibrous capsules resembling those seen in the other ponies.

All other organs and glands showed no tuberculosis.

Microscopical Examinations.

(Smear Preparations.)

Prescapular Gland.—Moderately numerous tubercle bacilli.

Lung (nodule I).—One tubercle bacillus seen.

Liver.—No tubercle bacilli.

Mesentery.—No tubercle bacilli.

Cultures.

No growth was obtained in cultures made from two prescapular glands and a lung nodule.

PONY 4 (Aged). Virus A VIII.

Fed once with culture derived from the original material.

Dose—100·0 milligrammes.

Date of Feeding—August 15, 1907.

Killed when in good health—January 22, 1908. [160 days after the experiment began.]

Clinical History.

There was no sign of ill-health during the experiment.

Temperature.

Normal.

Tuberculin Test.

October 29, 1907. [75 days after the experiment began.] Dose of tuberculin (avian) 4·0 cc. Rise of temperature 2·0° C.

Weights.

	kilos.
August 15, 1907	212·64
January 22, 1908	235·36

Total gain in weight.—22·72 kilos.

POST-MORTEM EXAMINATION.

General condition good.

Intestines.—Beneath the mucous membrane of the small intestine two minute opaque foci were seen.

Large Intestine.—Normal.

Mesenteric Glands.—There was an opaque focus in one mesenteric gland.

Mesentery.—In the mesentery between the layers there were about 20 hard irregular nodules (parasitic) up to 1 cm. in diameter. On section they showed a firm dirty yellow shell containing soft yellow necrotic substance in the centre. There was slight thickening and necrosis of a mesenteric artery. In conditions resembling these in other ponies small worms have been found.

Liver.—There were a few scattered calcareous nodules within grey capsules similar to those seen in other adult ponies.

All other organs and glands were normal.

Microscopical Examinations.

(Smear Preparations.)

Liver.—No tubercle bacilli.

Intestine (opaque focus).—No tubercle bacilli.

Intestine (gritty nodule).—No tubercle bacilli.

Mesentery (nodules).—No tubercle bacilli.

Mesenteric Gland (opaque foci).—No tubercle bacilli.

PIG 248. Virus A VIII.

Intravenous inoculation with culture derived from the original material.

Dose—50·0 milligrammes.

Date of Inoculation—April 7, 1908. [Age 19 weeks.]

Died—May 24, 1908. [47 days after inoculation.]

Clinical History.

The animal quickly became ill, and emaciated rapidly. It was pale and had an infrequent hoarse cough.

Tuberculin Test.

May 13, 1908. [36 days after inoculation.] Dose of tuberculin (avian) 2·0 cc. No reaction.

Weights.

	kilos.
April 7, 1908	46·25
May 24, 1908	31·74

Loss in weight.—14·41 kilos.

POST-MORTEM EXAMINATION.

Body.—Emaciated.

Lungs.—The lungs filled the pleural cavities. The extremities of the anterior lobes were reddish grey and solid. The rest of the lungs was oedematous and emphysematous, but not congested.

Bronchial Glands.—They were a little firmer than normal; the right showed an opaque yellowish focus.

Spleen.—The spleen was enlarged, and the pulp was firm and dark red in colour.

Liver.—Normal.

Portal Glands.—These glands were firm, and showed scattered streaks of soft yellowish necrotic substance.

Intestines.—There were patches of congestion in the mucous membranes.

There was no sign of tuberculosis elsewhere.

Microscopical Examinations

(Smear Preparations.)

Lung (substance)	Numerous tubercle bacilli.
Liver (do.)	
Spleen (do.)	

Kidney (substance).—A few tubercle bacilli.

Intestine (Peyer's patch)	Numerous tubercle bacilli.
Mesenteric Gland ...	

VIRUS A X. (Lung of a Fowl).

CULTURE INOCULATIONS.

I.—July 9, 1907.

The strain was derived from the original material, and had been in cultivation a total period of 161 days.

The culture used was the 5th generation, 21 days old.

DOGS.

Number.	Method.	Dose.	Duration of Life.	Result.
162 (Puppy).	Intrav.	50·0 mg.	K. 146 days	No T.
164	Intrav.	50·0 mg.	K. 142 ,,	No T.

PIG 196.

Fed.

Dose · 50·0 mg.

Killed : November 28, 1907.

142 days

P.M.—Almost all the mesenteric glands contained caseous gritty nodules and masses; several colic glands were similar. There was no tuberculosis elsewhere.

PIG 198.

Fed.

Dose 50·0 mg

Killed . October 28, 1907.

111 days

P.M. — In one submaxillary gland there was a caseous tubercle The mesenteric glands were enlarged and occupied by soft caseous gritty masses. One bronchial gland showed a minute focus. There was no tuberculosis elsewhere

PIG 200.

Fed.

Dose . 50·0 mg

Killed : November 12, 1907.

126 days.

P.M —The mesenteric glands were closely beset with caseous gritty nodules In the lung a soft grey nodule was seen. There was no tuberculosis elsewhere.

GOAT 42.

Subcutaneous.

Dose : 50·0 mg.

Killed . October 15, 1907

98 days

P.M.—The local lesion was composed of gritty caseo-necrotic substance The prescapular gland contained masses of similar character. There were streaks of whitish gritty material in one testis, a single grey focus in each kidney, one or two nodules on the omentum and the peritoneum, and irregular calcareous granules in the mesenteric and colic glands

GOAT 44.

Subcutaneous

Dose · 10·0 mg

Killed : December 10, 1907.

154 days.

P M.—There were some caseo-calcareous tubercles at the seat of inoculation, half the prescapular gland was occupied by caseo necrotic masses. The liver contained three miliary tubercles, and there were small caseous gritty patches in the ileo-colic glands.

GOAT 48.

Subcutaneous.

Dose 50·0 mg.

Killed when very ill : September 30, 1907.

83 days.

P.M.—Small local ulcer. Gritty caseo - necrotic masses in left prescapular gland. The lungs contained a moderate number of translucent nodules, some with gritty centres. The liver showed a number of yellowish necrotic foci. There were three minute foci in one kidney The Peyer's patches were closely beset with pits with yellowish margins (T. B. swarming). The mesenteric glands were enlarged and caseo-necrotic There were caseous patches in the thoracic and portal glands. T.B. were seen in a smear from the spleen.

RABBITS.

Number	Method.	Dose.	Duration of Life.	Result.
1387	Intrav	0·1 mg	D. 26 days	G. T.
1385	Intrav.	0·01 mg.	K. 144 ,,	Chronic G. T.
1384	Intrav	0·001 mg.	D 78 ,,	G. T

GUINEA-PIGS.

Number.	Method	Dose	Duration of Life.	Result.
2556	Intrap.	1·0 mg.	D. 64 days	Subacute gen. T
2555	Intrap.	0·1 mg	K. 202 ,,	Local T
2557	Subcut.	10·0 mg	K. 202 ,,	No T.

II.—November 27, 1907.

The strain was derived from the original material, and had been in artificial cultivation a total period of 302 days

The culture used was the 7th generation, 21 days old.

MONKEY 188.

Intravenous.

Dose : 50·0 mg.

Died : Dec. 15, 1907.

18½ days.

P M.—Acute tuberculosis.

MONKEY 190.

Intravenous and intraperitoneal.

Dose : 1·0 mg.

Died : Dec. 23, 1907.

26 days.

P.M.—Acute tuberculosis.

MONKEY 196.

Intravenous.

Dose : 10·0 mg.

Died : Dec. 26, 1907.

29 days.

P.M.—Acute tuberculosis.

MONKEY 198.

Intravenous.

Dose : 100·0 mg. (slightly less than).

Died : Dec. 25, 1907

28 days.

P.M.—Acute tuberculosis.

RABBITS.

Number.	Method.	Dose.	Duration of Life	Result.
1557	Intrav.	0·1 mg.	D. 22 days	G. T.
1558	Intrav.	0·01 mg.	D. 53 ,,	G. T.

GUINEA-PIGS

Number.	Method.	Dose.	Duration of Life.	Result.
2917	Subcut.	50·0 mg.	D. 106 days	Local T.
2918	Subcut	50·0 mg.	D 99 ,,	Local T.

MICE.

Number.	Method.	Dose.	Duration of Life.	Result.
103	Intrap	10·0 mg.	K. 260 days	For Post-mortem results see Tables, pages 238-239.
101	Intrap.	1·0 mg.	D. 43 ,,	
100	Intrap.	0·1 mg.	D. 191 ,,	
99	Intrap	0·01 mg.	K 350 ,,	
105	Subcut	50·0 mg.	D 105 ,,	
106	Subcut.	50·0 mg.	D 128 ,,	
104	Subcut	10·0 mg.	K. 127 ,,	
102	Subcut.	1·0 mg.	K 350 ,,	

III.—May 21, 1908.

The strain was derived from the original material, and had been in cultivation a total period of 478 days.

The culture used was the 11th generation, 12 days old.

PIG 260.

Intravenous.

Dose : 50·0 mg.

Died : July 11, 1908.

51 days.

P.M.—The lungs were firm and oedematous, and the spleen slightly swollen. The lymphatic glands showed occasional yellowish grey patches. T.B. were numerous in all organs, the intestine, and the lymphatic glands.

PIG 262.

Intravenous.

Dose : 10·0 mg.

Died : July 30, 1908.

70 days.

P.M. — Lungs voluminous and firm; on section they were slightly congested and oedematous. Spleen a little firm. Liver pale. Lymphatic glands congested. T.B. were numerous in the organs, intestinal mucous membrane, and lymphatic glands.

PIG 264.

Subcutaneous.

Dose : 50·0 mg.

Killed : September 3, 1908.

105 days.

P.M. — Cystic local lesion filled with soft caseous substance. Soft nodule in a left inguinal gland and a few gritty tubercles in a right. Animal otherwise healthy.

PONY 32.

Intravenous.

Dose : 10·0 mg.

Died : June 5, 1908.

15 days.

P.M.—Acute tuberculosis.

PARROT 20.

Intravenous.

Dose : 0·01 mg.

Died : September 11, 1908.

113 days.

P.M.—Cavity in lung lined by yellowish white membrane (numerous T.B.); rest of lung pneumonic. A few foci in liver (T.B). Tubercles on peritoneum. No tuberculosis elsewhere.

FOWLS.

Number.	Method.	Dose.	Duration of Life	Result
384	Intrap.	0·1 mg.	D. 50 days	G. T.
382	Intrap.	0·01 mg.	D. 46 ,,	G. T.
390	Intrap.	0·0001 mg.	K. 50 ,,	Slight G. T.
388	Intrap.	0·00001 mg.	K. 50 ,,	Slight G. T.
386	Intrap.	0·000001 mg.	K. 50 ,,	No T

VIRUS A X. (Lung of Fowl).

CULTURE INOCULATIONS.

MAY 30, 1907.

The strain was derived from the original material, and had been in cultivation a total period of 191 days.

The culture used was the 4th generation, 21 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1359	Intrap.	1·0 mg.	D. 29 days	G. T.
1357	Subcut.	1·0 mg.	D. 176 „	Chronic T.

CALF 548.

Intravenous.
Dose : 100·0 mg.
Killed when dying : July 9, 1907.
40 days.

P.M.—Acute tuberculosis.

GUINEA-PIGS.

Material	Number	Method.	Duration of Life.	Result.
E. of lung	2560	Subcut.	K. 188 days	Local T. only.
	2561	Subcut	K. 188 „	
E. of spleen	2558	Subcut.	K 188 „	
	2559	Subcut.	K 188 „	

FOWLS.

Number	Method	Dose.	Duration of Life.	Result.
258	Intrav.	1·0 mg.	D. 31 days	G. T.
260	Intrap.	10·0 mg	K. 174 „	G. T. Local T. severe.
256	Subcut.	10·0 mg.	D. 44 „	G. T.

CALF 546.

Intravenous.
Dose : 50·0 mg.
Died : July 1, 1907.
32 days.

P.M.—Acute tuberculosis.

GUINEA-PIGS.

Material.	Number.	Method.	Duration of Life.	Result.
E. of lung	2542	Intrap	K. 158 days	Local T.
	2544	Intrap	K. 158 „	No T.
E. of liver	2543	Intrap.	K. 158 „	Local T.

RATS.

Number.	Method.	Dose.	Duration of Life	Result.
134	Intrap.	100·0 mg.	D. 12 days	Acute T. T. B. numerous in organs.

FOWL 264.

Fed with organs of Rat 134.
Killed : 162 days.

P.M.—General tuberculosis. Intestinal tuberculosis severe.

FEEDING EXPERIMENTS.

JANUARY 28, 1909.

The strain was derived from the original material, and had been in cultivation a total period of 739 days.

The culture used was the 15th generation, 5 days old.

GOAT 62.

Fed.
Dose : 60·0 mg.
Killed : March 25, 1909.

P.M.—Caseous foci in the tonsils. Caseation of submaxillary, right cervical, parotid, posterior pharyngeal, portal, mesenteric, and ileo-colic glands. Ulceration of small intestine. No tuberculosis elsewhere.

GOAT 64.

Fed.
Dose : 60·0 mg.
Killed : March 25, 1909.

P.M.—Caseous substance in tonsils. Caseation of posterior pharyngeal, ileo-colic, and mesenteric glands; foci in submaxillary and portal glands. Ulceration of the small intestine. No tuberculosis elsewhere.

VIRUS A X. (Lung of a Fowl)—*continued.*

INTRAVENOUS PASSAGE EXPERIMENT.

No. 1.

Emulsion of spleen of Calf 548 (*see* Table 148A).

CALF 550.
Intravenous.
Dose 20·0 cc
Died : August 14, 1907
36 days.
P.M.—Acute tuberculosis.

Emulsion of spleen, containing numerous T. B.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2592	Intrap.	1·0 cc.	D. 38 days	Sub-acute avian T.
2594	Intrap.	0·5 cc.	D. 44 „	
2593	Subcut.	0·5 cc.	K. 153 „	Local T.

CALF 562.
Intravenous.
Dose : 10·0 cc.
Died : September 15, 1907.
32 days.
P.M.—Acute tuberculosis.

Emulsion of liver, containing moderately numerous T. B.

Number.	Method.	Dose.	Duration of Life.	Result.
2620	Subcut	1·0 cc	D 5 days	Subacute infection (short blue-staining bacilli).
2621	Intrap.	1·0 cc	D. 5 „	

CALF 558.
Intravenous.
Dose : 5·0 cc.
Died : October 31, 1907.
45 days.
P.M.—Acute tuberculosis.

Emulsion of liver.

GUINEA-PIGS.

	Number	Method	Dose.	Duration of Life.	Result
E. of liver.	2868	Intrap.	0·5 cc.	D. 58 days	Local T.
	2867	Subcut	1·0 cc.	D 151 „	
E. of portal gland.	2869	Intrap.	—	D. 127 „	
	2870	Subcut	—	D. 62 „	
E. of bronchial gland.	2871	Intrap.	—	D. 37 „	Sub-acute avian T.

CALF 566.
Intravenous.
Dose : 5·0 cc (150,000,000 T. B.)
Killed when ill : Dec 13 1907.
43 days.
P.M.—Severe tuberculosis of the lungs, the thoracic, portal, and mesenteric glands, the small intestine, two cervical, and two pharyngeal glands were also affected

MICE (Fed with pieces of liver).

Number	Method.	Duration of Life.	Result.
79	Fed	K. 106 days	For Post-mortem results *see* Tables, page
80	Fed	D. 120 „	
81	Fed	D. 144 „	
82	Fed	D. 400 „	

Emulsion of liver. Spleen. Emulsion of mediastinal gland. Emulsion of mesenteric glands.

GUINEA-PIGS.

	Number	Method	Dose	Duration of Life.	Result
E. of liver.	2952	Subcut.	4·0 cc.	D. 110 days	No T.
E. of mesenteric gland.	2953	Subcut.	—	K. 115 „	Local T.

RABBITS.

	Number.	Method.	Dose.	Duration of Life.	Result.
E. of liver.	1599	Intrap.	10·0 cc.	K. 160 days	Chronic T.
	1597	Subcut.	10·0 cc.	K. 343 „	Local T.
E. of mediastinal gland.	1598	Intrav	1·0 cc.	D. 24 „	G. T.

CALF 574.
Subcutaneous.
Dose : 10·0 cc (no T. B seen).
Killed : March 31, 1908.
109 days.
P.M.—No local lesion. A few small caseous tubercles in prescapular gland. One glassy tubercle in lung. In a left bronchial gland there was a caseous nodule and a few tubercles around it

PIG 234.
Fed.
Dose nearly whole of spleen (no T. B. seen).
Killed : May 25, 1908
164 days.
P.M.—There was a miliary caseous nodule in the left submaxillary gland, and no tuberculosis elsewhere

MONKEY 194.
Subcutaneous
Dose : 4·0 cc containing numerous T. B.
Died February 2, 1908.
51 days.
P.M.—There was a cyst at the seat of inoculation and an ulcer in the overlying skin discharging purulent fluid. No tuberculosis elsewhere.

GUINEA-PIGS.

	Number.	Method.	Duration of Life.	Result.
E. of local lesion.	3011	Intrap	D 31 days	No T.
	3012	Subcut	D. 59 „	Local T.

PIG 236.
Intravenous.
Dose : 5·0 cc. containing numerous T. B.
Died : April 11, 1908.
120 days.
P.M. — The lungs were congested and showed some reddish grey areas : they contained numerous translucent tubercles with calcareous centres. The mesenteric glands showed a fine yellow network. The skin of the animal was covered with scabs (smear, T. B). One submaxillary gland, one iliac, and one rectal gland were affected. T. B. were numerous in the spleen, scanty in the bone marrow.

GUINEA-PIGS.

	Number.	Method.	Duration of Life.	Result.
E. of lung	3148	Subcut.	D. 45 days	Local T
E. of liver	3149	Subcut	D. 42 „	Local T.
E. of mesenteric gland.	3150	Subcut	K. 138 „	Local T. 2 foci in bronchial glands
E. of rectal gland	3151	Subcut	D. 47 „	Local T 3 foci in spleen

CULTURE INOCULATIONS.

August 1, 1908

The cultures used were the 4th generation, 10 days old, and had been in cultivation a total period of 123 days.

*Culture from Bronchial gland.

Number.	Method	Dose	Duration of Life	Result
G.P. 3309	Subcut	0·01 mg	D 9 days	No T.
G.P. 3310	Subcut.	0·1 mg	D. 55 „	G. T.
Rabbit 1865	Subcut	1·0 mg.	K. 121 „	G. T. severe.
Rabbit 1866	Subcut	10·0 mg	D 95 „	Chronic T.

* This culture was mammalian in type.

†Culture from Prescapular gland.

Number.	Method	Dose	Duration of Life.	Result
G.P. 3306	Intrap	0·1 mg	K. 96 days	Local T and a few nodules in lung
G.P. 3307	Subcut	10·0 mg	K 96 „	Local T.
G.P. 3308	Subcut.	10·0 mg	K 87 „	Local T.

† This culture was avian in type

VIRUS A X. (Lung of a Fowl)—*continued.*

INTRAVENOUS PASSAGE EXPERIMENT.

No. 2.

Emulsion of spleen of
Calf 548 (*see* Table 148A).

CALF 554.
Intravenous.
Dose : 10·0 cc.
Died : August 13, 1907.
35 days.

P.M.—Acute tuberculosis.

Emulsion of liver, containing numerous T. B.

CALF 560.
Intravenous.
Dose : 9·0 cc.
Died : September 23, 1907.
40 days.

P.M.—Acute tuberculosis.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2589	Intrap.	1·0 cc.	D. 37 days	Sub-acute avian T.
2591	Intrap.	0·5 cc.	D. 39 ,,	
2590	Subcut.	0·5 cc.	K. 154 ,,	Local T.

Emulsion of liver containing numerous T. B.

MICE (Fed with pieces of liver)

Number	Method.	Duration of Life.	Result.
71	Fed	K. 29 days	For Post-mortem results *see* Tables, page
72	Fed	K. 57 ,,	
73	Fed	K. 78 ,,	
74	Fed	K. 142 ,,	
75	Fed	D. 223 ,,	
76	Fed	K. 379 ,,	

CALF 564.
Intravenous.
Dose : 9·0 cc.
Died : November 7, 1907.
45 days.

P.M.—Acute tuberculosis.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2628	Intrap.	1·0 cc.	D. 58 days	Sub-acute avian T.
2626	Intrap.	0·5 cc.	D. 49 ,,	
2627	Subcut.	1·0 cc.	K. 169 ,,	Local T.

GUINEA-PIG 2905.
Intraperitoneal.
Emulsion of spleen from Guinea-pig 2626
Died : 143 days.

P.M.—Nodules in omentum containing pus. Animal otherwise healthy.

Emulsion of liver containing moderately numerous T. B.

CALF 570.
Intravenous.
Dose : 5·0 cc.
Died : December 9, 1907.
31 days.

P.M.—Acute tuberculosis.

GUINEA-PIGS.

	Number.	Method.	Dose.	Duration of Life.	Result.
E. of liver	2900	Intrap.	0·5 cc.	D. 55 days	Acute avian T.
	2898	Subcut.	1·0 cc.	D. 122 ,,	Local T.
	2899	Subcut.	1·0 cc.	D. 118 ,,	
E. of mediastinal gland.	2901	Intrap.	—	D. 119 ,,	

Emulsion of liver in which T. B. were moderately numerous.

GOAT 50.
Subcutaneous.
Dose : 6·0 cc
Killed : August 5, 1908.
240 days.

P.M.—At seat of inoculation there were fibrous nodules with caseo-purulent gritty contents Left prescapular gland partly softened, caseous, and gritty.

E. of prescapular gland.

GUINEA-PIGS.

r.	Method.	Duration of Life.	Result.
	Intrap.	K. 60 days	Local T.
	Intrap.	K. 60 ,,	Local T.
	Subcut.	K. 60 ,,	No T.

CALF 572.
Subcutaneous.
Dose : 9·0 cc.
Killed : May 20, 1908.
163 days.

P.M.—Fibro-caseo-calcareous local tumour. Softened caseous nodules in prescapular gland. There was a single tubercle in the lung, the liver, a suprarenal body, and a mesenteric gland.

GUINEA-PIGS.

	Number.	Method.	Duration of Life.	Result.
E. of local lesion.	3172	Intrap.	D. 31 days	Sub-acute avian T
E. of prescapular gland (1).	3174	Intrap	K. 105 ,,	Local T.
	3173	Subcut	K. 105 ,,	Local T.
E. of prescapular gland (2)	3177	Intrap.	K. 105 ,,	Local T.
	3175	Subcut.	K. 105 ,,	Local T.
	3176	Subcut.	K. 105 ,,	Local T.

GUINEA-PIGS.

	Number.	Method.	Duration of Life.	Result.
E. of liver.	2944	Subcut.	D. 28 days	Local T. T. B. in sternal gland.
	2945	Subcut.	D. 136 ,,	
E. of lung.	2946	Subcut	D. 149 ,,	
E. of spleen	2947	Subcut.	D. 101 ,,	Local T.

CALF 576.
Subcutaneous.
Dose : 7·0 cc.
Killed : May 20, 1908.
163 days.

P.M.—Slight thickening only at seat of inoculation ; some caseo-calcareous granules in prescapular gland ; one left cervical gland partly caseo-calcareous. Many mesenteric and colic glands each contained a few caseo-calcareous tubercles or a small caseous patch.

GUINEA-PIGS.

	Number.	Method.	Duration of Life.	Result.
E. of prescapular gland.	3179	Intrap.	K. 105 days	Local T.
	3178	Subcut	K. 105 ,,	Local T
E. of cervical gland	3182	Intrap.	K. 105 ,,	Local T.
	3181	Subcut.	K. 105 ,,	Local T.
E. of mesenteric gland.	3180	Intrap.	K. 105 ,,	No T.

MONKEY 192.
Subcutaneous.
Dose : 4·0 cc
Died : February 2, 1908.
55 days.

P.M.—Caseo-purulent tumour at seat of inoculation ; two opaque foci in one axilliary gland ; one translucent tubercle in the lung ; and no tuberculosis elsewhere.

E. of local lesion.

GUINEA-PIGS.

Number.	Method.	Duration of Life.	Result.
3009	Intrap.	D. 16 days	Acute avian T.
3010	Subcut.	D. 31 ,,	Local T.

PIG 196. Virus A X.

Fed once with culture derived from the original material.

Dose—50·0 milligrammes.

Date of Feeding—July 9, 1907. [Age 9 weeks.]

Killed when in good health—November 28, 1907. [142 days after feeding.]

Temperature.

Normal.

Tuberculin Tests.

September 18, 1907. [71 days after the experiment began.] Dose of tuberculin 2·0 cc. Negative reaction.

October 29, 1907. [112 days after the experiment began.] Dose of tuberculin 4·0 cc. Positive reaction. Rise of temperature 2·1° C.

Weights.

	kilos.
July 10, 1907	14·06
November 28, 1907	41·72

Total gain in weight.—27·66 kilos.

POST-MORTEM EXAMINATION.

General condition good.

Tongue, Tonsils, Larynx, and Pharynx.—Normal.

Parotid, Submaxillary, Pharyngeal, and Cervical Glands.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Intestines.—Normal.

Mesenteric Glands.—The mesenteric glands were slightly enlarged, almost all contained caseous gritty nodules and masses replacing in many cases the greater part of the gland substance; these nodules easily shelled out leaving smooth walled cavities.

Colic Glands.—Several of the small colic glands contained nodules similar to those in the mesenteric glands.

Spleen.—Normal.

Liver and Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Renal, Coeliac, Lumbar, and Iliac Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—Normal.

Bronchial and Mediastinal Glands—Normal.

Heart.—Normal.

Other Lymphatic Glands.

Prescapular, Precrural, and Inguinal Glands.—Normal.

Smear preparations from the *Lung, Spleen, Liver and Kidney* showed no tubercle bacilli. *Mesenteric Gland* showed moderately numerous tubercle bacilli.

PIG 198. Virus A X.

Fed once with culture derived from the original material.

Dose—50·0 milligrammes.

Date of Feeding—July 9, 1907. [Age 9 weeks.]

Killed when in good health—October 28, 1907. [111 days after feeding.]

Temperature.

Normal.

Tuberculin Test.

September 18, 1907. [71 days after the experiment began.] Dose of tuberculin 2·0 cc. No reaction.

Weights.

	kilos.
July 10, 1907	13·60
October 28, 1907	39·44

Gain in weight.—25·84 kilos.

POST-MORTEM EXAMINATION.

General condition good.

Tongue, Tonsils, and Pharynx.—Normal.

Submaxillary Glands.—In one right submaxillary gland there was a soft caseous tubercle.

Pharyngeal Glands.—Normal.

Cervical Glands.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Intestines.—Normal.

Gastric Glands.—Normal.

Mesenteric Glands.—The mesenteric glands were enlarged and almost all were filled and practically replaced by soft caseous gritty masses which easily shelled out leaving smooth walled cavities.

Spleen.—Normal.

Liver.—Normal.

Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Renal, Coeliac, Lumbar, and Iliac Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—On the surfaces of the lungs just beneath the pleura there were several grey completely translucent nodules up to nearly a hemp seed in size (? parasitic); there was also a small grey patch around a bronchiole which on section contained several round worms.

Bronchial Glands.—In one bronchial gland there was a minute opaque focus. The rest were normal.

Mediastinal Glands.—Normal.

Heart.—Normal.

Various Lymphatic Glands.

Parotid, Prescapular, Prepectoral, Axillary, Precrural, Ischiatic, Gluteal, and Popliteal Glands.—Normal.

Smear preparations from the *Lung* (substance and nodule), *Spleen, Liver, Kidney,* and *Intestinal Mucous Membrane* showed no tubercle bacilli. *Mesenteric Gland* a few scattered tubercle bacilli.

PIG 200. Virus A X.

Fed once with culture derived from the original material.

Dose—50·0 milligrammes.

Date of Feeding—July 9, 1907. [Age 9 weeks.]

Killed when in good health—November 12, 1907. [126 days after feeding.]

Temperature.

Normal.

Tuberculin Tests.

September 18, 1907. [71 days after the experiment began.] Dose of tuberculin, 2·0 cc. No reaction.

October 29, 1907. [112 days after the experiment began.] Dose of tuberculin, 4·0 cc. Positive reaction. Rise of temperature, 2·2° C.

Weights.

	kilos.
July 10, 1907	16·78
November 12, 1907	28·11

Gain in weight.—11·33 kilos.

POST-MORTEM EXAMINATION.

General condition good.

Tongue, Tonsils, and Pharynx.—Normal.

Submaxillary Glands.—Normal.

Pharyngeal Glands.—Normal.

Cervical Glands.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Intestines.—Normal.

Mesenteric Glands.—The mesenteric glands were not obviously enlarged, but were closely beset throughout the whole chain with yellow caseous gritty nodules ; these nodules easily shelled out ; they replaced the greater part of the gland substance.

Spleen.—Normal.

Liver.—Normal.

Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Renal, Coeliac, Lumbar, and Iliac Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—The lungs showed a few congested patches on the dorsal surfaces, and just beneath the pleura there was a single soft grey nodule.

Bronchial and Mediastinal Glands.—Normal.

Heart.—Normal.

Various Lymphatic Glands.

Parotid, Prescapular, Prepectoral, Axillary, Precrural, Ischiatic, Popliteal, and Gluteal Glands.—Normal.

Microscopical Examination.

(Smear Preparations.)

Lung	No tubercle bacilli.
Spleen... ...	
Liver	
Kidney ...	
Peyer's Patch	

Mesenteric Gland.—Moderately numerous tubercle bacilli.

GOAT 42. Virus A X.

Subcutaneous inoculation of culture derived from the original material.

Dose—50·0 milligrammes.

Date of Inoculation—July 9, 1907. [Age 9 months.]

Killed when in good health—October 15, 1907. [98 days after inoculation.]

Temperature.

The temperature rose sharply on the fourth day after inoculation to 41·6° C. and slowly fell until the ninth day. It subsequently varied between 39° and 39·8° for several weeks until it became steady and normal.

Tuberculin Test.

September 18, 1907. [71 days after the experiment began.] Dose, 2·0 cc. of tuberculin. Reaction negative.

Weights.

	kilos.
July 9, 1907	26·30
October 15, 1907	27·66

Gain in weight.—1·36 kilos.

POST-MORTEM EXAMINATION.

General condition good.

Local Lesion.—On the left side of the neck, situated in the muscle, there was a somewhat pear-shaped tumour 8 cm. long and 5 cm. at its widest diameter. On section it consisted of a firm translucent fibrous wall enclosing pinkish caseo-necrotic substance with gritty streaks; in the centre there was a cavity containing turbid fluid.

The tumour was situated near the gland, and in the neighbouring tissue between them were discrete caseo-calcareous tubercles and nodules up to a wheat grain in size.

Prescapular Glands.—The left prescapular gland consisting of two parts joined by a narrow neck each measuring 2·8 by 2·2 cm. On section it contained pinkish caseo-necrotic masses with calcareous streaks replacing more than half the substance.

The right prescapular glands measured each 1·5 by 1·6 cm. On section they were normal.

Prepectoral Glands.—Normal.

Cervical Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—At the extremities of the caudal lobes of both lungs there were areas beset with small, and for the most part ill-defined grey nodules, many of which were yellowish in the centre; they were in the depth of the lung, but could be felt on palpation beneath the pleura. They were produced by Strongylus Filaria; otherwise the lungs were normal.

Bronchial and Mediastinal Glands.—Normal.

Heart.—Normal.

Abdomen.

Omentum.—In the omentum, attached by a narrow pedicle, there was a reddish nodule 1 by ·5 cm., which on section contained yellowish necrotic substance.

Peritoneum.—On the parietal peritoneum on the left side there were three grey nodules the size of rape seeds.

Diaphragm.—Normal.

Small Intestine.—Normal.

Large Intestine.—In the large intestine beneath the mucous membrane there was a caseo-purulent nodule the size of a millet seed.

Gastric Glands.—Normal.

Mesenteric Glands.—The majority of the mesenteric glands contained in the cortices irregular calcareous granules, in many places forming a network which in all cases was easily picked out from the substance.

Colic Glands.—Many of the colic glands contained nodules resembling those in the mesenteric glands.

Spleen.—Normal.

Liver.—Normal.

Portal Glands.—Normal.

Kidneys.—In each kidney there was a single grey focus.

Testes.—In a testis there were several wedge-shaped streaks of whitish gritty substance.

Tongue, Tonsils, Larynx, and Pharynx.—Normal.

Various Lymphatic Glands.

Parotid, Submaxillary, Posterior pharyngeal, Precrural, Renal, Coeliac, Lumbar, Iliac, and Popliteal Glands.—Normal.

Microscopical Examinations.

(Smear Preparations.)

Local Lesion.—Very numerous tubercle bacilli.

Left Prescapular Gland.—Moderately numerous tubercle bacilli.

Lung (nodule).—No tubercle bacilli.

Kidney focus.—No tubercle bacilli.

Omental Nodule.—A few tubercle bacilli.

Mesenteric Gland.—Two tubercle bacilli seen.

Intestine (scraping from).—No tubercle bacilli.

Testis (nodule).—A few tubercle bacilli.

GOAT 44. Virus A X.

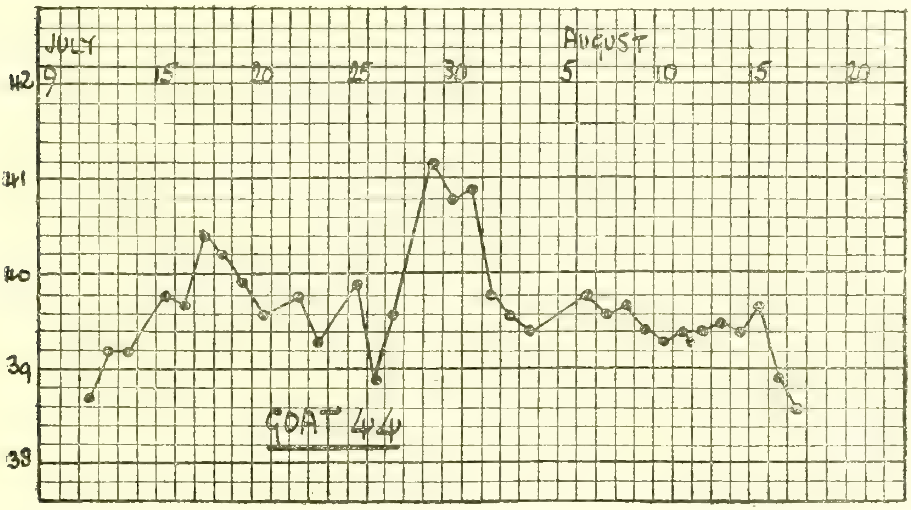
Subcutaneous inoculation of culture derived from the original material.

Dose—10·0 milligrammes.

Date of Inoculation—July 9, 1907. [Age 7 months.]

Killed when in good health—December 10, 1907. [154 days after inoculation.]

Temperature.



After August 16, 1907, the temperature remained normal except for a short rise in November.

Tuberculin Tests.

September 18, 1907. [71 days after the experiment began.] Dose 2·0 cc. of tuberculin. No reaction.

October 29, 1907. [112 days after inoculation.] Dose of tuberculin 4·0 cc. Positive reaction. Rise of temperature 2·7° C.

Weights.

	kilos.
July 9, 1907	21·77
December 10, 1907	25·40

Gain in weight.—3·63 kilos.

POST-MORTEM EXAMINATION.

General condition good.

Local Lesion.—At the seat of inoculation on the left side of the neck, in the subcutaneous tissue and in the muscle, there were scattered irregular caseo-calcareous tubercles, a few elongated but none larger than millet seeds.

Prescapular Glands.—The left prescapular gland was enlarged measuring 4 by 2·3 by 2·2 cm. Almost half the gland was replaced by a mass of pinkish caseo-necrotic tissue easily shelling out. In the other half there was a pea-sized nodule of similar substance.

The right prescapular gland measured 2·9 by 1·2 by 0·7 cm. On section it was normal.

Cervical Glands.—In the cortex of the left superior cervical gland just beneath the capsule were scattered caseo-calcareous granules. Other cervical glands normal.

Axillary Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—At the caudal extremities of each posterior lobe both in the centre and in the margins, were several firm grey patches, translucent around the periphery, becoming slightly opaque and yellowish towards the centre; the patches measured up to 3 cm. in diameter and scattered around them were smaller nodules similar in structure. The anterior lobes showed an occasional firm grey nodule. These nodules were due to parasites (Strongylus Filaria) which were easily found on microscopical examination.

Mediastinal Glands.—Normal.

Bronchial Glands.—Normal.

Heart.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Intestines.—Normal.

Mesenteric Glands.—Normal.

Ileo-Colic Glands.—In these glands just beneath the capsule there were several small patches composed of yellowish caseous gritty collections.

Spleen.—Normal.

Liver.—In the liver just beneath the surface there were three translucent miliary tubercles with opaque gritty centres; no more were seen on section.

Portal Glands.—Normal.

Kidneys.—Normal.

Renal, Coeliac, Lumbar, and Iliac Glands.—Normal.

Tongue, Tonsils, Larynx, and Pharynx.—Normal.

Uterus, Ovaries, Mammary, and Supramammary Glands.—Normal.

Submaxillary, Precrural, and Popliteal Glands.—Normal.

Microscopical Examinations.

(Smear Preparations.)

Prescapular Gland (emulsion). — Moderately numerous tubercle bacilli.

Lung (nodule).—A few tubercle bacilli.

Lung (nodule; fresh specimen).—Motile worms.

Liver (tubercle).—No tubercle bacilli.

GOAT 48. Virus A X.

Subcutaneous inoculation of culture obtained from the original material.

Dose—50·0 milligrammes.

Date of Inoculation—July 9, 1907. [Age about 5 months.]

Killed when very ill—September 30, 1907. [83 days after inoculation.]

Temperature.

The temperature rose to 41° C. on the 5th day. It subsequently varied between 39·1° and 40·5° with a gradual downward inclination.

Weights.

	kilos.
July 9, 1907	12·25
September 30, 1907	8·39

Loss on initial weight.—3·86 kilos.

POST-MORTEM EXAMINATION.

General condition poor.

Local Lesion.—At the seat of inoculation on the left side of neck there was an oval ulcer measuring 5 by 4 cm., the base of which was formed by the muscle; the floor was about two-thirds clean, while one-third was covered with pus coming from under the margin. The rest of the margin was thin and very little undermined.

Left Prescapular Gland.—The left prescapular gland measured 6 by 4 by 2 cm. On section the substance was almost replaced by two masses of caseo-necrotic slightly gritty substance.

There was some oedema around the left prescapular gland, and several flattened firm fibro-caseous tubercles up to 3 mm. in diameter.

Right Prescapular Gland.—This gland measured 2·7 by 1·5 by 0·6 cm.; on section it was normal. The tissues around it were slightly oedematous.

Prepectoral Glands.—Normal.

Cervical Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—The lungs did not quite collapse, they were oedematous and slightly congested; they showed on the surfaces numerous irregular translucent nodules, the majority with opaque yellowish, occasionally gritty centres; they were distinctly palpable. On section through the substance, they were distributed throughout but in fewer numbers. Many were caused by the Strongylus Filaria.

Thoracic Lymphatic Glands.

The Bronchial and Dorsal Mediastinal Glands were not obviously enlarged, and contained a moderate number of irregular, discrete, caseous patches, similar to those in the portal glands.

Heart.—Normal.

Diaphragm.—Normal.

Abdomen.

Omentum.—In the omentum there were two flat translucent tubercles with opaque centres up to 2 mm. in diameter.

Peritoneum.—Normal.

Intestines.—The Peyer's patches of the small intestine were closely beset with irregular sharply marked pits varying up to 3 and 4 mm. roughly ; the margins of the pits were slightly more opaque than the rest of the patch and yellowish in colour.

Large Intestine.—Normal.

Gastric Glands.—They showed small caseous tubercles.

Mesenteric Glands.—These glands were enlarged and firm, and the majority of them had their cortices almost completely replaced by firm caseo-necrotic substance, in many parts of which could be seen a network of congested capillaries.

Spleen.—Normal.

Liver.—The surface of liver presents a greyish mottled appearance from the presence of numerous irregular grey and yellowish necrotic foci. On section through the substance they were much less numerous.

Portal Glands.—The portal glands contained in the cortices small irregular discrete yellowish caseous patches.

Kidneys.—In the cortex of left kidney there were three minute greyish white foci.

Right Kidney.—Normal.

Suprarenal Bodies.—Normal.

Renal, Coeliac, Lumbar, and Iliac Glands.—Normal.

Tongue, Tonsils, Larynx, and Pharynx.—Normal.

Parotid, Submaxillary, Pharyngeal, Precrural, Popliteal, Gluteal, and Ischiatic Glands.—Normal.

Microscopical Examinations.

(Smear Preparations.)

Lung (substance) showed moderately numerous tubercle bacilli with a few small clumps.

Spleen (substance) } Some scattered tubercle bacilli,
Liver (do.) } but chiefly in small clumps.

Omentum (nodule) showed a few tubercle bacilli.

Peyer's patch showed swarms of tubercle bacilli.

DOG 162 (Puppy). Virus A X.

Intravenous inoculation with culture derived from the original material.

Dose—50·0 milligrammes.

Date of Inoculation—July 9, 1907.

Killed—December 2, 1907. [146 days after inoculation.]

Tuberculin Tests.

The animal was tested 71 days and 112 days after inoculation and gave no reaction. The dose on the first occasion was 4·0 cc. of bovine tuberculin ; on the second 4·0 cc. of avian tuberculin.

Weights.

	grammes.
July 9, 1907	4850
December 2, 1907	9400

Gain in weight.—4550 grammes.

POST-MORTEM EXAMINATION.

General condition good.

Lungs.—In the lung there were two translucent foci of doubtful nature.

Kidneys.—In one kidney there were two small grey nodules with opaque centres.

All other organs and glands were quite healthy.

No tubercle bacilli could be found in smears made from the substance of the lung, liver, and spleen.

DOG 164 (Adult). Virus A X.

Intravenous inoculation with culture derived from the original material.

Dose—50·0 milligrammes.

Date of Inoculation—June 9, 1907.

Weight—10,270 grammes.

Killed—November 28, 1908. [142 days after inoculation.]

Tuberculin Tests.

The animal was tested 101 days after inoculation and gave no reaction. It was retested 142 days after inoculation and gave a rise of temperature of 1° C. The dose on the first occasion was 4·0 cc. of bovine tuberculin ; on the second 4·0 cc. of avian tuberculin.

POST-MORTEM EXAMINATION.

General condition good.

Lungs.—Normal.

Spleen.—In the spleen there were two nodules, one projecting, the size of a small pea ; on section they consisted of soft grey translucent tissue (not tuberculous).

Kidneys.—In the cortices of the kidneys there were a few scattered grey nodules with, in a few cases, opaque centres the largest the size of a rape seed. (Non-tuberculous nodules often found in the kidneys of dogs.)

All other organs and glands appeared normal.

Microscopical Examinations.

(Smear Preparations.)

Spleen (nodule).—No tubercle bacilli.

Kidney (nodule).—No tubercle bacilli.

Cultures.

Cultures were sown from the liver, kidney, and spleen substance. In each case moderately numerous typical avian colonies developed.

MONKEY 188. Virus A X.

Intravenous inoculation of culture from the original material.

Dose—50·0 milligrammes.

Date—November 27, 1907.

Died—December 15, 1907. [18 days after inoculation.]

POST MORTEM EXAMINATION.

Lungs.—The lungs collapsed normally; they were congested and slightly oedematous and on close inspection a few minute grey foci up to 1·0 mm. could be seen.

Bronchial Glands.—They were oedematous; otherwise normal.

Spleen.—The spleen was swollen measuring 6 by 4 by 1·5 cm. On section the malpighian bodies were enlarged; no definite grey points could be seen.

Liver.—The substance showed a fine grey network outlining the lobules and in patches apparently made up of minute grey points.

Kidneys.—The cortices were pale.

Other organs and glands normal.

Microscopical Examinations.

Numerous tubercle bacilli were demonstrated in smears made from the lung, liver, spleen, and bronchial gland; a few in the kidney.

MONKEY 190. Virus A X.

Intravenous and intraperitoneal inoculation of culture from the original material.

Dose—1·0 milligramme. [0·5 intravenously and 0·5 intraperitoneally.]

Date—November 27, 1907.

Died—December 23, 1907. [26 days after inoculation.]

POST-MORTEM EXAMINATION.

Lungs.—The lungs were oedematous and the left was congested. No tubercles could be seen.

Bronchial Glands.—The bronchial glands were enlarged and oedematous; they showed in the cortices numerous opaque yellowish foci.

Abdomen.

Omentum.—The omentum was not retracted, but was uniformly thickened with greyish opaque tubercles lying chiefly along the blood vessels, varying up to a millet seed in size. The spaces between the vessels were covered with minute grey tubercles.

Mesentery.—On the mesentery there were similar tubercles but not so numerous.

Spleen.—The spleen measured 6 by 3·5 by 1·5 cm. It was soft and on section the pulp was closely packed with minute grey points.

Liver.—Normal.

Portal Glands.—They were oedematous but showed no sign of caseation.

Kidneys.—Normal.

Abdominal Glands.—They were oedematous but showed no sign of caseation.

Microscopical Examinations.

(Smear Preparations.)

Lung (substance).—No T.B.

Spleen (substance).—Moderately numerous T.B.

Liver (substance).—A few T.B.

Bronchial Gland.—Numerous T.B.

MONKEY 196. Virus A X.

Intravenous inoculation of culture from the original material.

Dose—10·0 milligrammes.

Date—November 27, 1907.

Died—December 26, 1907. [29 days after inoculation.]

POST-MORTEM EXAMINATION.

Lungs.—The lungs felt slightly firm and were a little oedematous. The right was slightly congested and both showed dark pigmentary mottling.

Spleen.—The spleen was slightly enlarged. On section the malpighian bodies were prominent but otherwise the pulp was normal in appearance.

Liver.—The substance was pale. The surface beneath the capsule was normal, but on section numerous rather indefinite grey points could be seen through a hand lens.

Kidneys.—They were pale but otherwise normal.

Lymphatic Glands.—They appeared enlarged and were oedematous but showed no sign of caseation.

Microscopical Examinations.

(Smear Preparations.)

Lung (substance).—Numerous tubercle bacilli.

Liver (substance).—Very numerous tubercle bacilli.

Spleen (substance).—Very numerous tubercle bacilli.

Kidney (substance).—A few tubercle bacilli.

Mesenteric Gland.—Very numerous tubercle bacilli.

MONKEY 198. Virus A X.

Intravenous inoculation of culture from the original material.

Dose—100·0 milligrammes.

Date—November 27, 1907.

Died—December 25, 1907. [28 days after the inoculation.]

POST-MORTEM EXAMINATION.

Lungs.—The lungs were pink and crepitant; they showed a few patches of congestion and emphysema, but no foci were visible.

Spleen.—The spleen was swollen, measuring 6·5 by 3·5 by 1·5 cm. The pulp was firm, and on section showed a faint grey tracing, and a moderate number of irregular small necrotic areas.

Liver.—The liver was pale, and in the darker areas could just be seen numerous minute grey points.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Lymphatic Glands.—All the lymphatic glands were enlarged and oedematous, and showed grey points which could be seen best in those that were congested.

Microscopical Examinations.

(Smear Preparations.)

Spleen (substance).—A mass of tubercle bacilli.

Liver (substance).—A mass of tubercle bacilli.

Mesenteric Gland.—A mass of tubercle bacilli.

Lung (substance).—Numerous tubercle bacilli.

Kidney (substance).—Numerous tubercle bacilli.

PIG 260. Virus A X.

Intravenous inoculation with culture derived from the original material.

Dose—50·0 milligrammes.

Date of Inoculation—May 21, 1908. [Age 15 weeks.]

Died—July 11, 1908. [51 days after inoculation.]

Clinical History.

The animal quickly became ill with laboured breathing, and rapidly lost flesh.

Temperature.

On the 12th day after inoculation the temperature rose to 40·9° C. It remained high (between 39·9 C. and 41·0° C.) for 34 days; it then fell rapidly, death ensuing within a few days.

Weights.

	Kilos.
May 21, 1908	29·48
July 11, 1908	16·77

Loss in weight.—12·71 kilos.

POST-MORTEM EXAMINATION.

Lungs.—The lungs were firm, and did not collapse normally. They were not congested, but were oedematous and emphysematous. There were a few scattered reddish-grey patches.

Spleen.—The spleen was slightly swollen.

Liver.—Normal in appearance.

Kidneys.—Normal in appearance.

Intestines.—They were thin and congested.

Lymphatic Glands.—The lymphatic glands showed occasionally very indefinite, small yellowish grey patches.

Microscopical Examinations.

(Smear Preparations.)

Lung (substance).—Very numerous tubercle bacilli.

Spleen (substance).—Swarms of tubercle bacilli.

Liver (substance).—Very numerous tubercle bacilli.

Intestine (scraping).—Numerous tubercle bacilli.

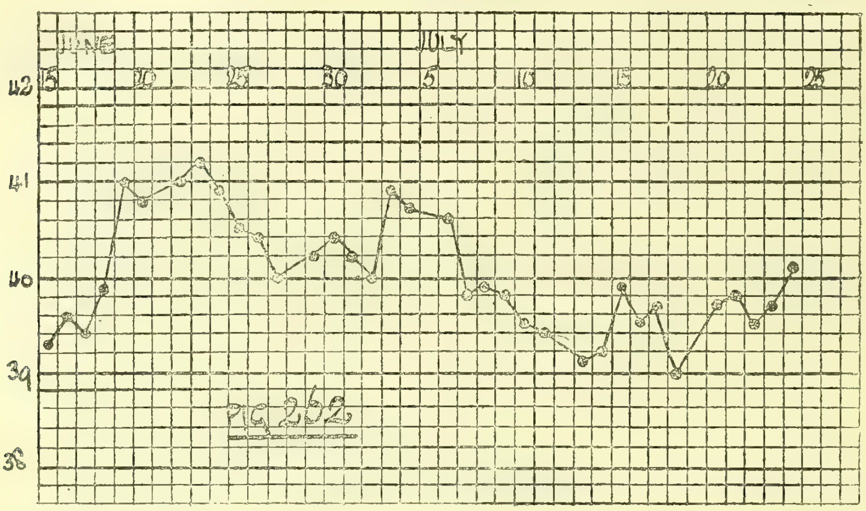
Mesenteric Gland.—Swarms of tubercle bacilli.

Precrural Gland.—Numerous tubercle bacilli.

PIG 262. Virus A X.

Intravenous inoculation with culture derived from the original material.
Dose—10·0 milligrammes.
Date of Inoculation—May 21, 1908. [Age 15 weeks.]
Died—July 30, 1908. [70 days after inoculation.]

Temperature.



Weights.

	Kilos.
May 21, 1908	30·38
July 30, 1908	20·86

Loss of weight.—9·52 kilos.

POST-MORTEM EXAMINATION.

Carcass emaciated.

Thorax.

Lungs.—The lungs were voluminous and cut somewhat firmly. The anterior inferior extremities were reddish grey, and solid; the rest of the lungs showed on section patchy congestion and slight oedema.

The bronchial glands were congested.

Abdomen.

Intestines.—Normal.

Spleen.—The spleen weighed 140 grammes, and on section the pulp was a little firm and red.

Liver.—The liver was a pale yellowish colour.

Portal Glands.—In a portal gland there was a small soft, yellowish necrotic nodule.

Kidneys.—Normal.

Tonsils.—In the tonsils there were a few soft yellow miliary nodules, and in one a small ulcer was seen.

The majority of the lymphatic glands were congested, but showed no definite foci.

Other organs and glands appeared normal.

Microscopical Examinations.

(Smear Preparations.)

Lung (substance).—Swarms of tubercle bacilli.

Spleen (substance).—Swarms of tubercle bacilli.

Liver (substance).—Swarms of tubercle bacilli.

Mesenteric Gland.—Swarms of tubercle bacilli.

Kidney (substance).—Very numerous tubercle bacilli.

Inguinal Gland.—Very numerous tubercle bacilli.

Intestine (scraping).—Very numerous tubercle bacilli.

PIG 264. Virus A X.

Subcutaneous inoculation with culture derived from the original material.
Dose—50·0 milligrammes.
Date of Inoculation—May 21, 1908. [Age 15 weeks.]
Killed—September 3, 1908. [105 days after inoculation.]

Clinical History.

There was no sign of ill-health during the experiment.

Weights.

	Kilos.
May 21, 1908	31·75
September 3, 1908	43·54

Gain in weight.—11·79 kilos.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—At the seat of inoculation there was a tumour about the size of a hen's egg in the subcutaneous tissue, over which the skin was intact. On section it consisted of a thin-walled cyst filled with soft yellow caseous substance.

Inguinal Glands.—A left inguinal gland contained a nodule about the size of a sparrow's egg composed of soft caseous substance.

In a right inguinal gland there were three or four soft caseous slight gritty tubercles.

Kidneys.—In the cortices there was a moderate number of translucent miliary nodules of doubtful nature (no T.B.).

There was no tuberculosis elsewhere.

Microscopical Examinations.—Smear preparations from the lung, liver, spleen, intestine, and mesenteric gland showed no tubercle bacilli.

PONY 32 (Aged). Virus A X.

Intravenous inoculation of culture derived from the original material.
Dose—10·0 milligrammes.
Date of Inoculation—May 21, 1908.
Died—June 5, 1908. [15 days after inoculation.]

Clinical History.

The animal began to breathe quickly within a few days after the inoculation. The frequency increased and the animal went down, June 4, breathing violently.

Temperature.

The temperature was at 40° C. the day after the injection and remained high until the animal's death; the highest point reached was 40·5° C.

Weights.

	Kilos
May 21, 1908	273·00
June 5, 1908	259·39

Total loss of weight.—13·61 kilos.

POST-MORTEM EXAMINATION.

General condition fair.

Thorax.

Pleura.—Normal.

Lungs.—The lungs were voluminous, heavy, and water-logged. The parenchyma was deeply congested as well as oedematous, especially the anterior inferior portions which sank in water.

Mediastinal and Bronchial Glands.—Normal.

Heart.—Normal.

Abdomen

Omentum and Peritoneum.—Normal.

Intestines.—Normal.

Mesenteric Glands.—Normal.

Colic Glands.—Normal.

Spleen.—The spleen was swollen and dark red in colour. It weighed 1·47 kilogrammes.

Liver.—The liver substance was pale.

Portal Glands.—Normal.

Kidneys.—In the cortices of the kidneys there were scattered hæmorrhagic foci.

Suprarenal Bodies.—Normal.

Renal, Lumbar, Coeliac, and Iliac Glands.—Normal.

Tongue, Tonsils, Larynx, and Pharynx.—Normal.

Parotid, Submaxillary, Retro-pharyngeal, Cervical, Prescapular, Prepectoral, Axillary, Precrural, Pudic, and Popliteal Glands were dark and congested.

Microscopical Examinations.

(Smear Preparations.)

Lung showed moderately numerous tubercle bacilli.

Liver showed a few tubercle bacilli.

Spleen showed a few tubercle bacilli.

Kidney showed a few tubercle bacilli.

Prescapular Gland showed a few tubercle bacilli.

Mesenteric Gland showed a few tubercle bacilli.

CALF 546. Virus A X.

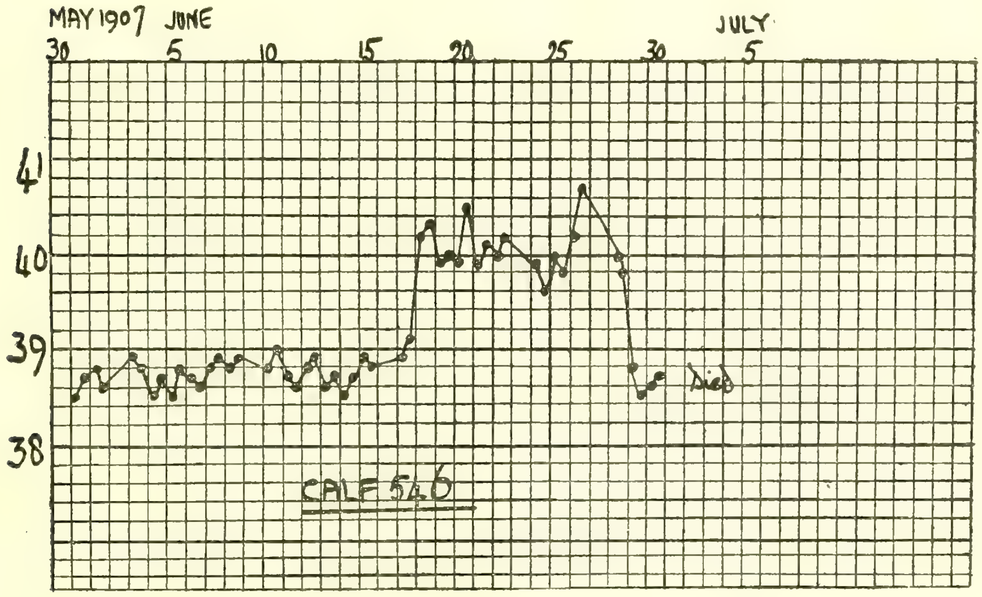
Intravenous inoculation of culture derived from the original material.

Dose—50·0 milligrammes.

Date of Inoculation—May 30, 1907. [Age about 12 weeks.]

Died—July 1, 1907. [32 days after inoculation.]

Temperature.



Weights.

	Kilos.
May 30, 1907	55·76
July 1, 1907	50·79

Total loss in weight.—4·97 kilos.

POST-MORTEM EXAMINATION.

Condition poor.

Thorax.

Pleura.—Normal.

Lungs.—In the cephalic lobes, the right middle and the anterior portions of the caudal lobes, there were large dark red areas of consolidation, which, however, did not completely replace those parts of the lungs, since they still floated in water. The rest of the lung tissue was moderately congested and oedematous.

Bronchial and Mediastinal Glands.—These glands were congested and somewhat oedematous but showed no caseation.

Pericardium.—The pericardium was a little injected.

The tissues of the posterior mediastinum were oedematous.

Abdomen.

Peritoneum and Omentum.—Normal.

Intestines.—Normal.

Mesenteric Glands.—These glands appeared normal.

Spleen.—The spleen was greatly enlarged and weighed 907 grammes. On section the substance was dark red and contained two greyish nodules, becoming yellow towards the centre and about 6 mm. in diameter.

Liver.—The surface of the liver showed the interlobular network well marked, and on section the substance was congested.

Portal Glands.—These glands appeared normal.

Kidneys.—On the surface of the kidneys beneath the capsule there a few foci of congestion.

Suprarenal Bodies.—These appeared normal.

Coeliac, Renal, and Lumbar Glands.—All were a little enlarged and congested.

Tongue, Pharynx, Larynx, and Tonsils.—Normal.

Various Lymphatic Glands.

Precrural Glands.—Normal.

Gluteal and Popliteal Glands.—These glands were oedematous.

Left Prescapular Gland.—This gland was enlarged and oedematous from a recent inoculation of tuberculin.

Many of the remaining lymphatic glands showed some amount of congestion but no caseation.

Microscopical Examinations.

(Smear Preparations.)

Lung (substance) showed numerous scattered tubercle bacilli and a few small clumps.

Mediastinal Gland (substance) showed numerous tubercle bacilli.

Spleen (pulp). — Moderately numerous tubercle bacilli.

Liver (substance).—Numerous tubercle bacilli.

Scraping from Intestine showed a few tubercle bacilli.

GOAT 62. Virus A X.

Fed once with culture derived from the original material. (Dose given with milk through a rubber teat.)

Dose—60 milligrammes.

Date of Feeding—January 28, 1909. [Age 5 days.]

Killed when in good general health—March 25, 1909. [56 days after inoculation.]

Weights.

	Kilos.
January 29, 1909	3·05
March 25, 1909...	6·30

Gain in weight.—3·25 kilos.

POST-MORTEM EXAMINATION.

Carcass in fair condition.

Tonsils.—Each tonsil showed a few caseous streaks and foci.

Parotid Glands.—The right gland was enlarged and contained several soft caseous areas beneath the cortex. The left was normal.

Cervical Glands.—The right superior cervical gland showed small caseous patches and foci in the cortex. The other right cervical glands and the left were normal.

Submaxillary Glands.—The submaxillary gland on each side was a little enlarged, and contained nodules formed of a caseous network in grey translucent tissue.

Posterior-pharyngeal Glands.—The right gland was about the size of a robin's egg, twice the size of that on the other side. It was firm, and on section was about half replaced by caseous tissue softening in parts. The gland on the left side contained caseous patches.

Abdomen.

Intestines.—The first Peyer's patch was much thickened and closely beset with serpiginous ulcers ; beneath the raised portions at the margins of the ulcers were numerous opaque caseous foci, and the floors were lined by easily detached soft caseo-necrotic substance. All the other Peyer's patches were similarly affected, and in many instances the base of the ulcer was formed merely by peritoneum. The margins of the ulcers were congested. The solitary follicles were prominent, congested, and showed at the top of each a small punched-out ulcer.

The large intestine appeared normal.

Mesenteric Glands.—The mesenteric glands were enlarged and firm, and on section they consisted of firm grey tissue beset with caseous areas, and many of the glands were considerably replaced by caseous tissue.

Ileo-colic Gland.—The ileo-colic gland, about the size of a pigeon's egg, showed a narrow margin of the cortex replaced by caseous tissue.

Spleen.—Normal.

Liver.—In the liver there were sparsely scattered minute irregular yellowish-grey foci.

Portal Glands.—In the cortex of one portal gland there were a few irregular caseous patches and foci.

Kidneys.—Normal.

Thorax.

Lungs.—The lungs appeared normal except for an occasional minute translucent focus. All other organs and glands appeared normal.

Microscopical Examinations.

(Smear preparations.)

Intestine (scraping).—Numerous tubercle bacilli.

Mesenteric Gland.—Moderately numerous tubercle bacilli.

Portal Gland }
Gastric Gland } A few scattered tubercle bacilli

Lung (substance) }
Liver ,, }
Spleen ,, } No tubercle bacilli.
Kidney ,, }

GOAT 64. Virus A X.

Fed once with culture derived from the original material. (Dose given with milk through a rubber teat.)

Dose—60 milligrammes.

Date of Feeding—January 28, 1909. [Age 5 days.]

Killed when in good general health—March 25, 1909. [56 days after inoculation.]

Weights.

	Kilos.
January 29, 1909	3·05
March 25, 1909	5·40

Gain in weight.—2·35 kilos.

POST-MORTEM EXAMINATION.

General condition.—Fair.

Tonsils.—The crypts of each tonsil were lined by soft caseous substance.

Submaxillary Glands.—The left submaxillary gland contained caseous foci. The right was normal.

Cervical Glands.—Normal.

Posterior Pharyngeal Glands. — Each posterior pharyngeal gland contained small softening caseous patches which in the left were confluent and formed caseous areas.

Abdomen.

Intestines.—The long Peyer's patch was greatly thickened and closely filled with narrow ulcerated clefts running round the gut. At the distal half they became wider and serpiginous. The floors of the ulcers were lined by yellowish softening caseo-necrotic tissue. All the other Peyer's patches were similarly extensively ulcerated, and in many cases the ulceration had extended down to the peritoneum.

Mesenteric Glands.—The mesenteric glands were enlarged, one to nearly the size of a hen's egg. The gland substance was firm and beset with caseous patches, most marked just beneath the capsule, and with caseous foci.

Ileo-Colic Glands.—One ileo-colic gland was enlarged and the cortex contained a network of caseous tissue while the rest of the gland was beset with caseous foci.

Spleen.—Normal.

Liver.—In the liver substance there were numerous minute grey points just visible.

Portal Glands.—The portal glands were a little firm and showed irregular opaque caseous foci in the cortices.

Kidneys.—In the cortices of the kidneys just beneath the surface could be seen a moderate number of ill-defined grey foci.

Thorax.

Lungs.—In the lungs could be seen sparsely scattered grey points of a doubtful nature.

Mediastinal Gland.—In the largest mediastinal gland a few opaque points could be seen. All other organs and glands appeared normal.

Microscopical Examinations.

(Smear preparations.)

Tonsil (caseous substance).—A moderate number of tubercle bacilli.

Intestine (scraping).—Numerous tubercle bacilli.

Lung (substance).—No tubercle bacilli.

Spleen (substance).—No tubercle bacilli.

Liver (substance).—No tubercle bacilli.

Kidney (substance).—No tubercle bacilli.

CALF 548. Virus A X.

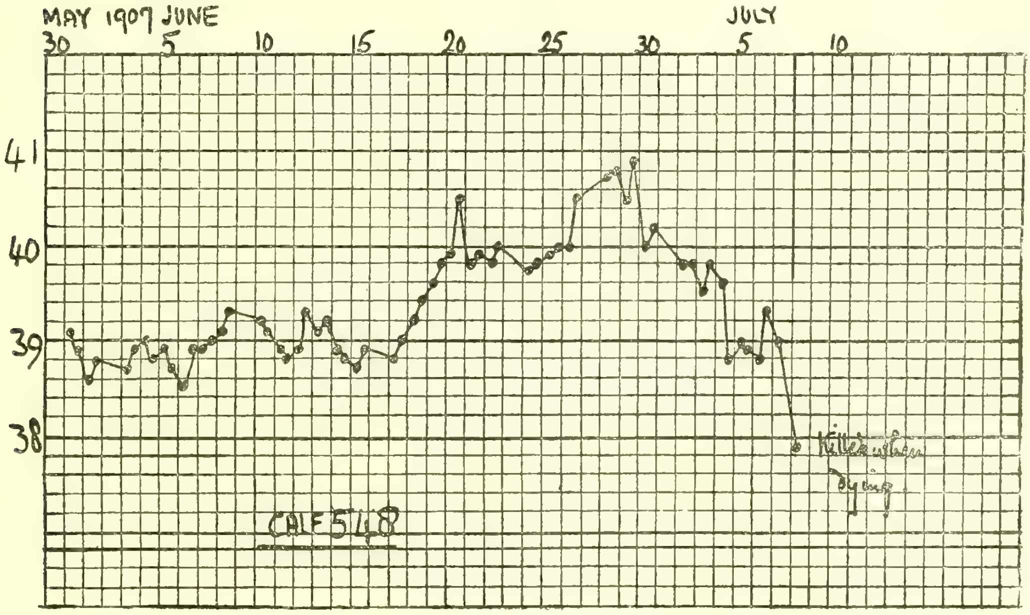
Intravenous inoculation of culture derived from the original material.

Dose—100·0 milligrammes.

Date of Inoculation—May 30, 1907. [Age about 10 weeks.]

Killed when dying—July 9, 1907. [40 days after inoculation.]

Temperature.



Weights.

	Kilos.
May 30, 1907	53·06
July 9, 1907	39·45

Total loss in weight—13·61 kilos.

POST-MORTEM EXAMINATION.

Condition poor.

Thorax.

Pleura.—Normal.

Lungs.—The lungs were not severely affected; they did not collapse quite normally and were oedematous. They showed, scattered throughout, dark red and reddish grey areas consisting of lobules in various stages of pneumonia; the dark red patches were completely airless; the reddish grey showed much oedema, but did not sink in water.

Bronchial and Mediastinal Glands.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Intestines.—The intestines appeared normal.

Mesenteric Glands.—These glands appeared normal.

Spleen.—The spleen was enlarged, and the pulp was soft and dark red.

Liver.—The surface of the liver presented a reddish mottled appearance, and the interlobular network was well marked. On section through the substance, parts were reddish grey and smooth, while there were scattered areas of a reddish yellow colour, the cut surfaces of which were finely granular.

Portal Glands.—These glands appeared normal.

Kidneys.—The kidneys were pale, and just beneath the capsule could be seen rather indefinite irregular paler grey foci.

Suprarenal Bodies.—They appeared normal.

Coeliac, Renal, Lumbar, and Iliac Glands.—Normal.

Tongue, Pharynx, Larynx and Tonsils.—Normal.

Various Lymphatic Glands.

Submaxillary, Parotid, Pharyngeal, Cervical, Prescapular, Prepectoral, Precrural, Pudic, Gluteal and Popliteal Glands all appeared normal.

Microscopical Examinations.

(Smear Preparations.)

Lung (substance).—Numerous tubercle bacilli.

Spleen (substance).—Numerous tubercle bacilli.

Liver (substance).—Very numerous tubercle bacilli, scattered and in clumps.

Kidney (substance).—Moderately numerous tubercle bacilli.

Mesenteric Gland (substance).—Tubercle bacilli, not quite so numerous as in the liver.

Intestine (scraping).—Moderately numerous tubercle bacilli.

CALF 550. Virus A X.

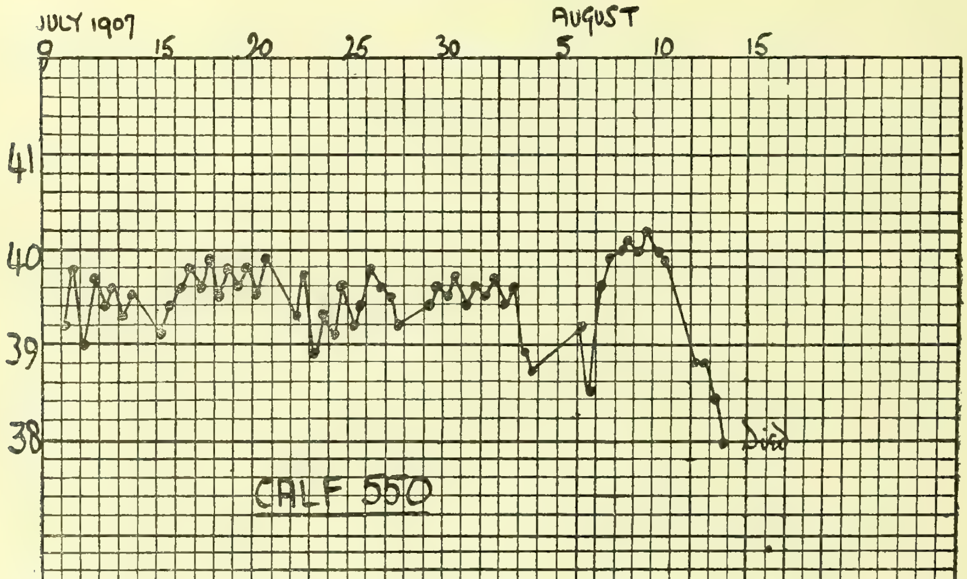
Intravenous inoculation of emulsion made with the spleen of Calf 548 (inoculated with culture of the original material).

Dose—20·0 cubic centimetres, containing numerous tubercle bacilli.

Date of Inoculation—July 9, 1907. [Age about 8 weeks.]

Died—August 14, 1907. [36 days after inoculation.]

Temperature.



Weights.

	Kilos.
July 9, 1907	46·25
August 14, 1907	31·74

Total loss of weight.—14·51 kilos.

POST-MORTEM EXAMINATION.

General condition poor.

Thorax.

Pleura.—The pleura appeared normal.

Lungs.—The lungs did not quite collapse; the ventral portions of the anterior and posterior lobes contained dark red solid airless areas. The rest of the lungs was congested and oedematous but air containing.

Thoracic Glands.—The bronchial and mediastinal glands were congested and a little oedematous but showed no caseation.

Pericardium and Heart.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Intestine.—The upper part of the small intestine showed some patchy congestion of the mucous membrane.

Spleen.—The spleen was enlarged and swollen and dark red in colour.

Liver.—The substance of the liver was speckled with very numerous minute grey and slightly yellowish foci.

Portal Glands.—In the portal glands there were scattered discrete irregular yellowish necrotic patches.

Kidneys.—The kidneys appeared normal except for oedema of the pelves.

Suprarenal Bodies.—These appeared normal.

The Pharynx and the base of the Tongue were deeply congested, (?) hypostatic.

Tonsils.—Normal.

Various Lymphatic Glands.

Posterior Pharyngeal Glands.—These were deeply congested.

Parotid, Submaxillary, Prescapular, Cervical, Prepectoral, Axillary, Precrural, Popliteal, Gluteal, Ischiatic, Coeliac, Mesenteric, Colic, Lumbar, and Iliac Lymphatic Glands.—All showed varying amounts of congestion and oedema.

Microscopical Examinations.

(Smear Preparations.)

Lung (substance) showed numerous tubercle bacilli.

Spleen (substance) showed fairly numerous tubercle bacilli.

Liver (substance) showed numerous tubercle bacilli.

Kidney (substance) showed a few tubercle bacilli.

Mediastinal Gland (substance) showed numerous tubercle bacilli.

Intestine (scraping) showed a moderate number of tubercle bacilli.

CALF 554. Virus A X.

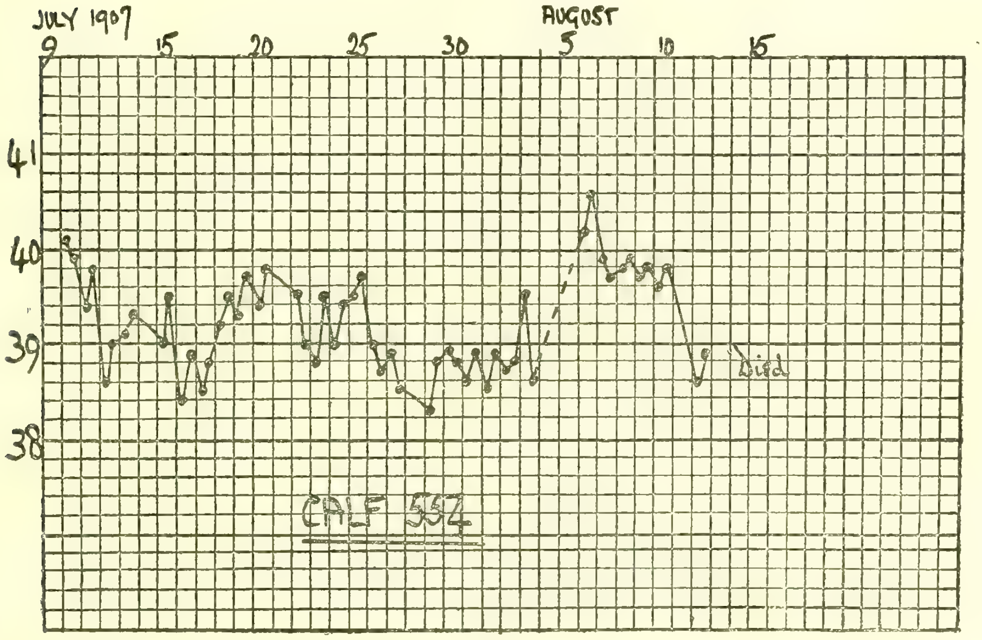
Intravenous inoculation of emulsion made with the spleen of Calf 548 (inoculated with culture of the original material).

Dose—10·0 cubic centimetres, containing numerous tubercle bacilli.

Date of Inoculation—July 9, 1907. [Age about 7 weeks.]

Died—August 13, 1907. [35 days after inoculation.]

Temperature.



Weights.

	Kilos.
July 9, 1907	41·27
August 13, 1907	34·92

Total loss in weight.—6·35 kilos.

POST-MORTEM EXAMINATION

Condition poor.

Thorax.

Pleura.—Normal.

Lungs.—The lungs did not collapse normally; the whole of the anterior lobes and the right middle lobe were dark red, solid, and airless with an indication of a fine greyish mottling. Parts of the anterior portions of the caudal lobes were similarly consolidated, but the rest, the majority, was congested and oedematous, though still air containing.

Bronchial and Mediastinal Glands.—These glands were oedematous, many of them congested, but none showing any caseation.

Pericardium and Heart.—Normal.

Abdomen.

Peritoneum, Omentum, and Diaphragm.—Normal.

Intestines.—The intestines appeared normal.

Spleen.—The spleen was enlarged, firm, and the substance dark red, otherwise normal in appearance.

Liver.—The substance of the liver was speckled with very minute irregular greyish foci.

Kidneys.—The kidneys were somewhat dark in colour and showed in the cortices just beneath the capsule hæmorrhagic foci ; on section the pelves were oedematous.

Suprarenal Bodies.—Normal.

The upper part of the Larynx, the Epiglottis, and the Pharynx were congested.

The tissues about the body generally were oedematous.

Various Lymphatic Glands.

Parotid, Submaxillary, Cervical, Prescapular, Prepectoral, Axillary, Precrural, Popliteal, Ischiatic, Gluteal, Coeliac, Lumbar, Iliac, and Mesenteric Glands.—All were oedematous, and many of them congested, but in none was there any caseation.

Microscopical Examinations.

(Smear Preparations.)

Lung (substance)	Showed numerous tubercle bacilli.
Spleen (substance)	
Liver (substance)	
Mediastinal Gland (substance)	
Intestine, small (scraping) ...	

Kidney (substance).—A moderate number of tubercle bacilli.

CALF 562. Virus A X.

Intravenous inoculation of an emulsion made from the spleen of Calf 550.

Dose—10·0 cubic centimetres.

Date of Inoculation—August 14, 1907. [Age about 9 weeks.]

Died—September 15, 1907. [32 days after inoculation.]

Temperature.

The temperature rose to 39·7° on the 15th day, and remained about that point until the 28th day, when it reached 40·3° C. It dropped two days later and remained normal until death.

Weights.

	Kilos.
August 14, 1907	35·83
September 15, 1907	28·57

Total loss in weight.—7·26 kilos.

POST-MORTEM EXAMINATION.

General condition poor.

Thorax.

Pleura.—Normal.

Lungs.—The lungs collapsed fairly well, but were deeply congested and oedematous, especially in the anterior lobes and the anterior thirds of the posterior lobes. No part, however, was completely airless.

Bronchial and Mediastinal Glands.—Normal.

Pericardium and Heart.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Intestines.—The mucous membrane of the intestine was irregularly congested.

Mesenteric Glands.—Normal in appearance.

Spleen. — The spleen weighed 141 grammes ; on section it appeared normal.

Liver.—Normal.

Portal Glands.—Normal.

Kidneys.—The kidneys were rather dark in colour, otherwise normal.

Suprarenal Bodies.—Normal.

Renal, Lumbar, and Iliac Glands.—Normal.

Pharynx.—The pharynx was slightly congested

Tongue, Larynx, and Tonsils.—Normal.

The Prescapular, Axillary, Cervical, and Pharyngeal Lymphatic Glands were congested.

Various Lymphatic Glands.

Coeliac, Precrural, Popliteal, Gluteal, and Ischiatic Glands.—Normal.

Microscopical Examinations.

(Smear Preparations.)

Lung (substance).—Moderately numerous tubercle bacilli.

Spleen (substance).—Numerous tubercle bacilli.

Liver (substance).—Moderately numerous tubercle bacilli.

Kidney (substance).—A few tubercle bacilli.

Mesenteric Gland (substance). — Very numerous tubercle bacilli with a number of small clumps.

Intestine (scraping).—Numerous tubercle bacilli as in the mesenteric gland.

CALF 560. Virus A X.

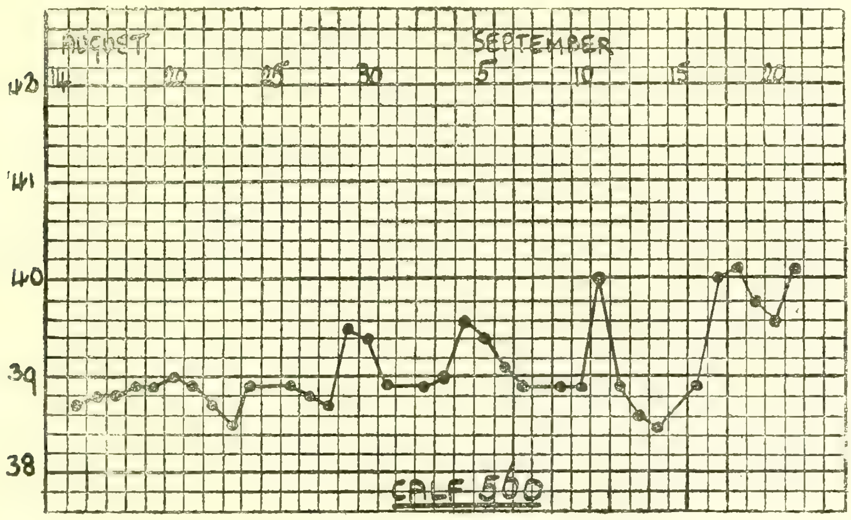
Intravenous inoculation of an emulsion made from the liver of Calf 554.

Dose—9·0 cubic centimetres.

Date of Inoculation—August 14, 1907. [Age 9 weeks.]

Died—September 23, 1907. [40 days after inoculation.]

Temperature.



Weights.

	Kilos.
August 14, 1907	44·90
September 23, 1907	33·56

Total loss in weight.—11·34 kilos.

POST-MORTEM EXAMINATION.

General condition poor.

Thorax.

Pleura.—Normal.

Lungs.—The anterior lobes of both lungs and more than half of the left posterior lobe were dark reddish grey and airless. On section the solid areas presented a greyish mottled appearance and minute drops of pus could be expressed; the rest of the lung tissue was crepitant, containing only a few consolidated patches.

Bronchial and Mediastinal Glands.—These glands were congested and oedematous, but showed no caseation.

Pericardium and Heart.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Intestines.—Normal.

Mesenteric Glands.—The mesenteric glands were oedematous but otherwise normal.

Spleen.—The spleen weighed 196 grammes. On section the splenic pulp appeared normal.

Liver.—The liver was normal.

Portal Glands.—Normal.

Kidneys.—The kidneys were a little pale and showed minute subcapsular hæmorrhages The pelves were oedematous.

Suprarenal Bodies.—Normal.

Renal, Coeliac, Lumbar, and Iliac Lymphatic Glands.—Normal.

Tongue, Larynx, Pharynx, and Tonsils.—Normal.

Various Lymphatic Glands.

Parotid, Submaxillary, Cervical, Prescapular, Prepectoral, Axillary, Precrural, Popliteal, and Gluteal Lymphatic Glands.—These glands were oedematous, especially those in the anterior part of body, and some showed also minute foci of congestion.

Microscopical Examinations.

(Smear Preparations.)

Lung (substance).—Showed very numerous tubercle bacilli.

Liver (substance). — Showed numerous tubercle bacilli, some in clumps.

Spleen (substance).—Showed moderately numerous tubercle bacilli.

Kidney (substance).—Showed moderately numerous tubercle bacilli.

Prescapular Gland (substance).—Showed a few tubercle bacilli.

Mesenteric Gland (substance).—Showed numerous tubercle bacilli.

CALF 558. Virus A X.

Intravenous inoculation with an emulsion made from the liver of Calf 562.

Dose—5·0 cubic centimetres.

Date of Inoculation—September 16, 1907. [Age about 14 weeks.]

Died—October 31, 1907. [45 days after inoculation.]

Temperature.

The temperature rose to 39·8° C. on the 35th day and reached 40·1° on the 38th day. On the 42nd day it fell again to normal.

Weights.

	Kilos.
September 16, 1907	34·00
October 31, 1907	35·37

Gain of weight.—1·37 kilos.

POST-MORTEM EXAMINATION.

General condition poor.

Thorax.

Pleura.—Normal.

Lungs.—The lungs were rather heavy, not collapsing normally ; the anterior lobes of both lungs were to a great extent reddish grey and airless. The anterior portion of the left caudal lobe was also pneumonic, and in the substance of the rest of the posterior lobes there were scattered pneumonic lobules most numerous on the left side. The pneumonic parts were in a condition of red hepatisation without any necrosis.

Bronchial and Mediastinal Glands.—They were enlarged and firm, and on section the cortices were replaced by a definite yellowish waxy caseous network.

Heart and Pericardium.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Intestines.—Normal.

Mesenteric Glands.—These were oedematous but showed no caseation.

Spleen.—The spleen weighed 252 grammes. The substance was firm and showed some sparsely scattered ill-defined greyish necrotic patches, and also some prominence of the malpighian bodies, many of which appeared slightly necrotic in the centre.

Liver.—On the surface of the liver there was an occasional minute greyish white focus. On section the substance, beyond slight congestion, appeared normal.

Portal Glands.—The portal glands were moderately enlarged. On section the cortices were firm, and to a great extent consisted of greyish necrotic tissue with a yellowish tint, in parts in the form of a network, in others as uniform nodules.

Kidneys.—The pelves of the kidneys were oedematous ; otherwise the kidneys were normal in appearance.

Suprarenal Bodies.—The cortices of the suprarenal bodies were closely beset with minute grey foci.

Renal, Coeliac, Lumbar, Iliac, Parotid, Submaxillary, Pharyngeal, Cervical, Prescapular, Prepectoral, Precrural, Popliteal, Gluteal and Ischiatic Glands showed varying amounts of oedema, but no caseation.

Microscopical Examinations.

(Smear Preparations.)

Lung (substance) ... *Spleen* (necrotic patch)	Numerous tubercle bacilli.

Liver (substance).—Moderately numerous tubercle bacilli.

Kidney (substance).—A few tubercle bacilli.

Bronchial Gland (substance) *Portal Gland* (substance) ... *Small Intestine* (scraping) ...	Very numerous tubercle bacilli.

CALF 564. Virus A X.

Intravenous inoculation with an emulsion made from the liver of Calf 560.

Dose—9·0 cubic centimetres.

Date of Inoculation—September 23, 1907. [Age about 15 weeks.]

Died—November 7, 1907. [45 days after inoculation.]

Temperature.

The highest point reached was 40·1° C. on the 25th day. It remained about that point until the 32nd day, when it fell and subsequently remained about normal.

Weights.

	Kilos.
September 23, 1907	50·80
November 7, 1907	46·72

Total loss of weight.—4·08 kilos.

POST-MORTEM EXAMINATION.

General condition poor.

Thorax.

Pleura.—Normal.

Lungs.—The anterior lobes of the lungs were deeply congested and several portions were quite airless. The anterior portions of the caudal lobes resembled the anterior lobes, whilst the remaining portions of the posterior lobes were moderately congested and very oedematous.

Thoracic Lymphatic Glands.—The bronchial and mediastinal glands were congested and firm and on section the cortices were closely beset with yellow foci.

Heart.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Intestines.—Normal.

Mesenteric Glands.—They appeared normal.

Spleen.—The spleen weighed 336 grammes ; the substance was firm and on section there were several small ill-defined yellowish grey necrotic patches.

Liver.—The liver was congested but otherwise normal.

Portal Glands.—The portal glands were moderately enlarged and the cortices were firm and beset with yellowish streaks and foci forming a network.

Kidneys.—The cortices of the kidneys were speckled with hæmorrhagic points and the tissue in the pelves was oedematous.

Suprarenal Bodies.—Normal.

Renal, Coeliac, Lumbar, and Iliac Glands.—Normal.

Tongue, Tonsils, Larynx and Pharynx.—Normal.

Various Lymphatic Glands.

Parotid, Submaxillary, Pharyngeal, Prescapular, Cervical, Prepectoral, Axillary, Precrural, Popliteal, Gluteal and Ischiatic Glands.—Oedematous but otherwise normal.

Microscopical Examinations.

(Smear Preparations.)

Lung (substance)	Very numerous tubercle bacilli.
Spleen (do.)	
Liver (do.)	Moderately numerous tubercle bacilli.
Kidney (do.)	
Mediastinal Gland (substance)	Numerous tubercle bacilli.
Intestine, Small (scraping of mucous membrane).	

CALF 566. Virus A X.

Intravenous inoculation with an emulsion made from the liver of Calf 558.

Dose—5·0 cubic centimetres (estimated to contain 150,000,000 tubercle bacilli).

Date of Inoculation—October 31, 1907.

Killed when ill—December 13, 1907. [43 days after inoculation.]

Clinical History.

The calf was killed when moderately ill, emaciating, and breathing hard.

Temperature.

The temperature was irregular throughout, rising slowly up to the maximum of 40·3° on the 25th day. It fell slightly and remained about 39·6° until death.

Weights.

	Kilos.
October 31, 1907	60·32
December 13, 1907	49·89

Loss in weight.—10·43 kilos.

POST-MORTEM EXAMINATION.

General condition poor.

Thorax.

Pleura.—Normal.

Lungs.—The right anterior and middle lobes were reddish grey, solid, and airless. On section the lobules were dark red around the periphery and grey in the centre, and many were softened and muco-purulent; muco-pus could be expressed from the bronchi. The left anterior lobe was partly reddish grey and airless. The posterior lobes did not collapse normally; they were peppered with minute hæmorrhagic foci, and showed scattered pneumonic lobules and small solid areas. The bronchi contained muco-pus.

Thoracic Lymphatic Glands.—The bronchial and mediastinal glands were enlarged and firm. On section the majority showed their cortices replaced by firm yellowish caseated tissue in a translucent matrix.

Heart.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Intestines.—The large intestine appeared normal.

In the majority of the Peyer's patches of the small intestine there were from two to six palpable grey elevations which were slightly opaque, yellowish, and caseous in the centre.

Mesenteric Glands.—The mesenteric glands were enlarged and on section the cortices were firm grey with a fine yellowish caseous network. The majority showed the whole of their cortices thus affected; in the rest there were small discrete caseous patches.

The Ileo-Colic Glands resembled the mesenteric glands.

Spleen.—The spleen was slightly enlarged; substance appeared normal.

Liver.—Normal.

Portal Glands.—These glands were firm and beset with small yellowish early caseous patches.

Kidneys.—The kidneys were pale, otherwise normal.

Suprarenal Bodies.—Normal.

Renal, Coeliac, Lumbar, and Iliac Glands.—Normal.

Various Lymphatic Glands.

Parotid, Submaxillary, Axillary, Prescapular and Prepectoral, Precrural, and Popliteal Glands.—Normal.

Cervical Glands.—In the left superior cervical gland there was a nodule 1·7 by 1·0 cm., consisting of firm grey tissue with a caseous network resembling the mesenteric glands.

In the right cervical gland there was part of the gland, corresponding to the nodule on the other side, firm and grey but not caseating.

Pharyngeal Glands.—The right pharyngeal gland was enlarged and firm and a few opaque foci could be seen in the cortex.

The left pharyngeal gland was smaller and a few opaque foci could be seen.

Microscopical Examinations.

(Smear Preparations.)

Lung (pneumonic).—A few scattered tubercle bacilli.

Lung (muco-pus).—No tubercle bacilli.

Spleen (substance).—No tubercle bacilli.

Liver (substance).—No tubercle bacilli.

Mediastinal Gland (emulsion).—Numerous tubercle bacilli.

Mesenteric Gland (emulsion).—Moderately numerous tubercle bacilli.

Peyer's Patch.—Moderately numerous tubercle bacilli.

CALF 570. Virus A X.

Intravenous inoculation with an emulsion made from the liver of Calf 564.

Dose—5·0 cubic centimetres.

Date of Inoculation—November 8, 1907. [Age about 15 weeks.]

Died—December 9, 1907. [31 days after inoculation.]

Clinical History.

The animal had been slowly emaciating and breathing quickly for some time. Death occurred quite suddenly.

Temperature.

The temperature rose to 39·6° C. on the 10th day, and remained about that level until the 21st day, when it rose to 40·1° C. It dropped again to 39·4° and remained at that level until death.

Weights.

	Kilos.
November 8, 1907	64·85
December 9, 1907	52·60

Total loss in weight.—12·25 kilos.

POST-MORTEM EXAMINATION.

General condition poor.

Thorax.

Pleura.—Normal.

Lungs.—The right lung was dark red, solid and airless, sinking entirely in water. On section blood and oedema fluid exuded freely, but there was no sign of caseation. The left lung was oedematous and congested, especially in the anterior lobes, but still contained air.

Thoracic Lymphatic Glands.—The mediastinal and bronchial glands were definitely firmer than normal, but were not caseated; they were very congested, and on section were dark red in colour.

Heart.—Normal.

Abdomen

Omentum and Peritoneum.—Normal.

Intestines.—Normal.

Mesenteric Glands.—Normal.

Spleen.—The spleen weighed 196 grammes; it was enlarged and a little firmer than normal; splenic pulp otherwise normal.

Liver.—Normal.

Portal Glands.—The portal glands were firmer than normal, and in the cortices scattered small early caseous patches could be seen.

Kidneys.—In the cortices of the kidneys there were scattered bluish-black pigmented pits; the pelves were oedematous and contained some whitish flakes, a smear preparation from which showed a few small clumps and some scattered tubercle bacilli.

Suprarenal Bodies.—Normal.

Renal, Coeliac, Lumbar, and Iliac Lymphatic Glands. Normal.

Tongue, Tonsils, Larynx, and Pharynx.—Normal

Various Lymphatic Glands.

The prescapular and cervical glands were oedematous and a little firmer than normal.

The posterior pharyngeal glands were congested and oedematous.

Parotid, Submaxillary, Prepectoral, Axillary, Precrural, Popliteal, and Gluteal Glands.—Normal.

The tissues about the shoulders and neck were oedematous.

Microscopical Examinations.
(Smear Preparations.)

Lung.—Moderately numerous tubercle bacilli.
Liver.—Moderately numerous tubercle bacilli.
Spleen.—Numerous tubercle bacilli.

CALF 574. Virus A X.

Subcutaneous inoculation with an emulsion made from the liver of Calf 566.

Dose—10·0 cubic centimetres.

Date of Inoculation—December 13, 1907. [Age about 7 months.]

Killed when in good health—March 31, 1908. [109 days after inoculation.]

Temperature.

The temperature was normal throughout.

Tuberculin Tests.

January 31, 1908. [49 days after the experiment began.] Dose of tuberculin (bovine), 2·0 cc. No reaction.

March 13, 1908. [91 days after the experiment began.] Dose of tuberculin (bovine), 2·0 cc. Rise of temperature, 1·7° C.

POST-MORTEM EXAMINATION.

General condition good.

Local Lesion.—There was no local lesion visible.

Prescapular Glands.—The right prescapular gland showed at one end just beneath the capsule six soft caseous tubercles about the size of rape seed.

The left prescapular gland was normal.

Prepectoral Glands.—Normal

Cervical Glands.—Normal.

Axillary Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—On the pleura of the left lung there was a minute glassy tubercle, which cracked on pressure.

Bronchial Glands.—The left bronchial gland was not enlarged but was a little firm at one extremity, and on section showed a nodule composed of a network of caseous tissue, not appreciably gritty, in a grey translucent matrix. Immediately around it there were discrete opaque foci and a few grey tubercles with caseous centres up to about a millet seed in size.

Mediastinal Glands.—Normal.

Heart.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Intestines.—Normal.

Gastric, Mesenteric, and Colic Glands.—Normal.

Spleen.—Normal.

Liver.—In the liver there were a few opaque foci in a group surrounded by a zone of congestion.

Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Renal, Coeliac, Lumbar, and Iliac Lymphatic Glands.—Normal.

Tongue, Tonsils, Larynx, and Pharynx.—Normal.

Various Lymphatic Glands.

Parotid, Submaxillary. Posterior Pharyngeal, Precrural, Ischiatic, Gluteal, and Popliteal Glands.—Normal.

Microscopical Examinations.
(Smear Preparations.)

Emulsion of Prescapular Gland (I).—One tubercle bacillus seen.

Emulsion of Prescapular Gland (II).—No tubercle bacilli seen.

Lung (focus).—No tubercle bacilli seen.

Bronchial Gland (emulsion).—A moderate number of tubercle bacilli.

Liver (foci).—No tubercle bacilli seen.

CALF 572. Virus A X.

Subcutaneous inoculation with an emulsion made from the liver of Calf 570.

Dose—9·0 cubic centimetres.

Date of Inoculation—December 9, 1907. [Age about 20 weeks.]

Killed when in good health—May 20, 1908. [163 days after inoculation.]

Clinical History.

The animal showed no sign of ill-health during the experiment.

Temperature.

Normal throughout.

Tuberculin Tests.

January 31, 1908. [53 days after the experiment began.] Dose of tuberculin (bovine), 2·0 cc. No reaction.

March 13, 1908. [95 days after the experiment began.] Dose of tuberculin (bovine), 2·0 cc. No reaction.

May 13, 1908. [156 days after the experiment began.] Dose of tuberculin (avian), 2·0 cc. No reaction.

Weights.

	Kilos.
December 12, 1907	54·42
May 20. 1908	69·84

Total gain in weight.—15·43 kilos.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—In the subcutaneous tissue at the seat of inoculation on the left side of the neck, there was an irregular flattened thickening measuring 6 cm. in length by 3 cm. in greatest breadth and 6 cm. in thickness; it was firm and on section it was composed of fibrous tissue the central portion of which was beset with discrete caseo-calcareous granules.

Prescapular Glands.—The left prescapular gland measured 8 by 5 by 3 cm.; it was irregular in outline. On section it consisted of four cystic nodules separated by fibrous tissue. The nodules contained soft caseous gritty substance and the walls were composed of fibrous tissue crossed by trabeculæ of translucent tissue.

The right prescapular gland was normal.

Prepectoral Glands.—Normal.

Cervical Glands.—Normal.

Axillary Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—In the anterior lobe of one lung, there was a nodule composed of soft grey translucent tissue.

Bronchial and Mediastinal Glands.—Normal.

Heart.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Intestines.—Normal.

Mesenteric Glands.—One mesenteric gland showed an opaque yellowish focus.

Spleen.—Normal.

Liver.—In the depth of the liver there was a grey nodule the size of a millet seed with an opaque centre.

Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—In a suprarenal body there was a single yellow caseo-calcareous miliary tubercle.

Tongue, Tonsils, Larynx and Pharynx.—Normal.

Renal, Coeliac, Lumbar and Iliac Glands.—Normal.

Various Lymphatic Glands.

Precrural, Pudic, Gluteal, Popliteal, Submaxillary Parotid and Retro-pharyngeal Glands.—Normal.

Microscopical Examinations.
(Smear Preparations.)

Lung (nodule).—No tubercle bacilli.

Liver (tubercle).—No tubercle bacilli.

Mesenteric Gland (focus).—No tubercle bacilli.

Suprarenal Body (tubercle).—Moderately numerous tubercle bacilli.

Prescapular Gland (Emulsion I.).—Numerous tubercle bacilli.

Prescapular Gland (Emulsion II.).—Numerous tubercle bacilli.

CALF 576. Virus A X.

Subcutaneous inoculation with an emulsion made from the liver of Calf 570.

Dose—7·0 cubic centimetres.

Date of Inoculation—December 9, 1907. [Age about 20 weeks.]

Killed when in good health—May 20, 1908. [163 days after inoculation.]

Clinical History.

There was no sign of ill-health during the course of the experiment.

Temperature.

Normal throughout.

Tuberculin Tests.

January 31, 1908. [53 days after the experiment began.] Dose of tuberculin (bovine), 2·0 cc. No reaction.

March 13, 1908. [95 days after the experiment began.] Dose of tuberculin (bovine), 2·0 cc. No reaction.

May 13, 1908. [156 days after the experiment began.] Dose of tuberculin (avian), 2·0 cc. No reaction.

Weights.

	Kilos.
December 12, 1907	44·44
May 20, 1908	76·19

Total gain in weight.—31·75 kilos.

POST-MORTEM EXAMINATION.

General condition good.

Local Lesion.—In the muscle at the seat of inoculation there was a slight linear thickening about 1 cm. in breadth which on section was found to be fibrous tissue beset with irregular caseo-calcareous granules.

Prescapular Glands.—The left prescapular gland was slightly enlarged, it contained at one extremity just beneath the capsule a collection of caseo-calcareous granules about 6 mm. in diameter. There were also two similar but smaller nodules. The rest of the gland was normal.

The right prescapular gland was normal.

Prepectoral Glands.—Normal.

Cervical Glands.—The left inferior cervical gland was small but the superficial part of the cortex was replaced by a margin of caseo-calcareous tissue.

The other cervical glands were normal.

Axillary Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—Normal.

Bronchial and Mediastina Glands.—Normal.

Heart.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Intestines.—There was a moderate number of minute yellowish foci in the terminal Peyer's patch and a single focus in a second patch. The mucous membrane of the small intestine was normal.

The large intestine was normal.

Gastric Glands.—Normal.

Mesenteric Glands.—The majority contained either a few discrete caseo-calcareous tubercles about the size of rape seed, or a small ill-defined bright yellow patch just beneath the capsule, which on section was found to be composed of a fine network of yellow caseous tissue.

Colic Glands.—Several of the colic glands showed foci similar to those in the mesenteric glands.

Spleen.—Normal.

Liver.—Normal.

Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Renal, Coeliac, Lumbar, and Iliac Lymphatic Glands.—Normal.

Tongue, Tonsils, Larynx, and Pharynx.—Normal.

Various Lymphatic Glands.

Precrural, Pudic, Gluteal, Popliteal, Submaxillary, Parotid, and Retro-pharyngeal Glands.—Normal.

Microscopical Examinations.

(Smear Preparations.)

Prescapular Gland.—Numerous tubercle bacilli.

Left Inferior Cervical Gland.—Numerous tubercle bacilli.

Mesenteric Gland (I).—A few tubercle bacilli.

Mesenteric Gland (II).—A few tubercle bacilli.

Peyer's Patch.—No tubercle bacilli.

MONKEY 194. Virus A X.

Subcutaneous inoculation of emulsion of mediastinal gland of Calf 566.

Date—December 13, 1907.

Died—February 2, 1908. [51 days after inoculation.]

Clinical History.

Death occurred during very cold weather, which probably had some influence, and after a tuberculin test.

Tuberculin Test.

The monkey was tested 49 days after the inoculation and gave a positive reaction. Rise of temperature 1·4° C.

POST-MORTEM EXAMINATION.

General condition fair.

Local Lesion.—At the seat of inoculation in the subcutaneous tissue of the back, posterior to the scapulae, there was a prominent tumour measuring 8 by 5 by 2 cm. In the skin over it there was an ulcer measuring 2·5 mm. from which issued a purulent discharge. On section it consisted of a cyst containing a central mass of pinkish grey necrotic tissue beset with purulent foci, together with a little turbid serous fluid.

Axillary Glands.—Normal.

There was no sign of tuberculosis elsewhere in the body.

Microscopical Examinations.

(Smear Preparations.)

Spleen (substance).—No tubercle bacilli.

Liver (substance).—No tubercle bacilli.

Local Lesion.—Scattered tubercle bacilli.

Cultures.—A culture grown from the local lesion showed numerous typical aviar tubercle colonies

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PIG 234. Virus A X.

Fed once with almost the whole of the spleen of Calf 566.

Date of Feeding—December 13, 1907. [Age about 17 weeks.]

Killed when in good health—May 25, 1908. [164 days after the experiment began.]

Tuberculin Tests.

March 13, 1908. [91 days after the experiment began.] No reaction.

May 13, 1908. [152 days after the experiment began.] No reaction.

Weights.

	Kilos.
December 13, 1907	25·40
May 25, 1908	36·73

Gain in weight.—10·33 kilos.

POST-MORTEM EXAMINATION.

General condition good.

Tongue, Pharynx, and Larynx.—Normal.

Tonsils.—In one tonsil there was a soft brownish nodule.

Submaxillary Glands.—In a left submaxillary gland there was a soft yellowish caseous miliary nodule.

Oesophagus.—In the sub-epithelial tissue of the oesophagus there was a yellow muco-purulent nodule.

Pharyngeal Glands.—Normal.

Cervical Glands.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Intestines.—Normal.

Mesenteric and Colic Glands.—Normal.

Spleen.—Normal.

Liver and Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Renal, Coeliac, Lumbar, and Iliac Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—Normal.

Bronchial and Mediastinal Glands.—Normal.

Heart.—Normal.

Various Lymphatic Glands.

Prescapular, Precrural, and Inguinal Glands.—Normal.

Microscopical Examinations.

(Smear Preparations.)

Tonsil (focus).—No tubercle bacilli seen.

Oesophagus (nodule).—No tubercle bacilli. A few blue stained organisms.

Submaxillary Gland (nodule).—A moderate number of tubercle bacilli.

PIG 236. Virus A X.

Intravenous inoculation of an emulsion made from the mesenteric glands of Calf 566.

Dose—5·0 cubic centimetres.

Date of Inoculation—December 13, 1907. [Age about 17 weeks.]

Died—April 11, 1908. [120 days after inoculation.]

Clinical History.

The animal was emaciated and in very poor condition. The skin was covered with scabs.

Temperature.

There was no rise of temperature until the 18th of March, when it reached 40·1° C. It remained high until death.

Tuberculin Test.

March 13, 1908. [91 days after the experiment began.] No reaction.

Weights.

	Kilos.
December 12, 1907	26·58
April 11, 1908	23·76

Loss in weight.—3·18 kilos.

POST-MORTEM EXAMINATION.

General condition poor.

Thorax.

Lungs.—The lungs did not collapse normally; they were irregularly congested and emphysematous, and in parts contained reddish grey areas, very small pieces of which sank in water. Just beneath the pleura could be seen numerous discrete irregular translucent tubercles, the majority about the size of rape seed and a few a little larger. They had a yellowish tint, and most of them contained a central yellow calcareous granule. On section of the lung the tubercles were fairly evenly distributed, and they stood out from the freshly cut surface.

Bronchial Glands.—They appeared normal.

Spleen.—The substance was a little firm.

Liver.—A little pale.

Kidneys.—They were pale and had a greyish mottled appearance.

Intestines.—Normal.

Mesenteric Glands.—They were darker and firmer than normal ; the cortices were somewhat opaque, and showed a very fine almost invisible yellowish network. Occasionally in between the lobules there were streaks of yellowish and whitish substance.

Other Lymphatic Glands.—A rectal gland was enlarged and replaced by soft yellow substance.

A right iliac gland contained a grey nodule beset with purulent foci.

A left submaxillary gland showed a yellowish miliary nodule easily shelling out from the substance.

GOAT 50 (Adult). Virus A X.

Subcutaneous inoculation with an emulsion made from the liver of Calf 570.

Dose—6·0 cubic centimetres.

Date of Inoculation—December 9, 1907.

Killed when in good health—August 5, 1908. [240 days after inoculation.]

Clinical History.

The animal showed no sign of ill-health during the experiment. She bore a healthy kid.

Temperature.

The temperature remained normal throughout.

Tuberculin Tests.

March 13, 1908. [95 days after the experiment began.] Dose of tuberculin (bovine), 2·2 cc. Rise of temperature 1·0° C.

May 13, 1908. [156 days after the experiment began.] Dose of tuberculin (avian), 2·0 cc. Rise of temperature 1·9° C.

Weights.

	Kilos.
December 9, 1907	30·38
August 5, 1908	22·67

Loss in weight.—7·71 kilos.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—At the seat of inoculation in the subcutaneous tissues on the left side of the neck there were a few small fibrous nodules with yellow purulent gritty contents.

Prescapular Glands.—The left prescapular gland was enlarged measuring 3·7 by 2·2 by 1·0 cm. On section it was more than half cystic and filled with soft caseous, partly fluid, gritty contents.

The right prescapular gland was normal.

Prepectoral Glands.—Normal.

Cervical Glands.—Normal.

There was no tuberculosis elsewhere.

Microscopical examination of the prescapular gland showed moderately numerous tubercle bacilli.

MONKEY 192. Virus A X.

Subcutaneous inoculation of an emulsion of liver of Calf 570.

Date—December 9, 1907.

Died—February 2, 1908. [55 days after inoculation.]

Tuberculin Test.

The animal was tested 53 days after the experiment began and gave a positive reaction. Rise of temperature 1·1° C.

POST-MORTEM EXAMINATION.

Local Lesion.—At the seat of inoculation in the subcutaneous tissue of the back there was a lenticular tumour measuring 5 by 4 by 1·5 cm. The skin over it was intact. On section the tumour consisted of a mass of caseo-purulent nodules supported by a network of soft grey translucent tissue.

Axillary Glands.—They were a little enlarged, but otherwise were normal, except for one on the right side which showed two opaque foci just beneath the capsule.

Thorax.

Lungs.—The lungs were normal except for a single translucent tubercle in the left caudal lobe.

All other organs and lymphatic glands were normal.

Microscopical Examinations.

(Smear Preparations.)

Lung (tubercle)	No tubercle bacilli.
Spleen (substance)	
Liver (substance)	

Local Lesion.—Numerous tubercle bacilli.

VIRUS P II. (Submaxillary Gland of a Pig).

CULTURE INOCULATIONS.

I.—May 4, 1905.

Strain derived from original material. Total duration of artificial cultivation, 56 days.
The third generation of culture, 33 days old, was used.

PIG 104.

Intraperitoneal.

Dose: 10·0 mg.

Killed when well · July 12, 1905.

69 days.

P.M. — Small caseo-calcareous nodule in abdominal wall. On the peritoneum and omentum were moderately numerous caseous nodules. The kidneys showed a few grey foci; there were a few yellow tubercles on the surface of the liver. In the lungs were three grey nodules. The coeliac glands were largely caseated; many other abdominal and one or two thoracic glands contained yellowish streaks or foci.

CULTURE

Derived from Pig 104.

Inoculated on March 2, 1906, into:—

GUINEA-PIG 1923.

Subcut.

Died: 21 days.

P.M.—Local tuberculosis only.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
291	Intrav	1·0 mg.	D. 14 days	Acute G. T.
294	Intrap	5·0 mg.	D. 13 „	
292	Intrap.	1·0 mg.	D. 22 „	Acute G.T.
293	Subcut.	1·0 mg.	D. 149 „	Slight G.T.

GUINEA-PIGS.

Number	Method.	Dose	Duration of Life.	Result.
1533	Intrap.	5·0 mg	D. 19 days	Acute T.
1530	Intrap.	1·0 mg.	D. 21 „	
1531	Intrap.	1·0 mg	D. 52 „	Local T.
1532	Subcut.	1·0 mg.	D. 54 „	Slight T.

III.—August 12, 1905.

Strain derived from original material. Total duration of artificial cultivation, 156 days
The ninth generation of culture was used, 18 days old.

PIG 110.

Feeding.

Dose: The growth from 7 serum tubes.

Killed when well: Jan. 18, 1906.

159 days.

P.M.—Each submaxillary gland contained two yellow gritty tubercles. The majority of the mesenteric glands were almost entirely composed of dry caseo-calcareous substance. The ileo-colic and colic glands contained a few gritty tubercles. In the lungs were two grey translucent nodules.

GUINEA-PIGS.

Material.	Number.	Method.	Duration of Life.	Result
E. of mesenteric gland.	1860	Intrap.	D. 41 days	G. T.
	1859	Subcut.	D. 41 „	Local T.

GUINEA-PIG 1919.

Intraperitoneal.

Emulsion of inguinal gland of G.P. 1859.

Killed: 71 days.

P.M.—Pseudo-tuberculosis. No tubercle bacilli in smear preparations.

GUINEA-PIG 1920.

Emulsion of bronchial gland of G.P. 1860.

Died: 38 days.

P.M.—Soft yellow focus in a lumbar gland. Smear, numerous T.B.

RABBIT 667.

Subcutaneous.

Emulsion of mesenteric gland of Pig 110.

Killed: 106 days.

P.M.—Slight tuberculosis.

CULTURE.

Derived from Rabbit 667. The 2nd generation, 18 days old, was inoculated on July 3, 1906.

RABBIT 947.

Subcutaneous.

Killed: 156 days.

P.M.—Chronic tuberculosis.

CULTURE.

Strain derived from the mesenteric gland of Pig 110. Total duration of cultivation, two months. The 3rd generation of culture was used on March 24, 1906, when 24 days old.

PIG 136.

Subcutaneous.

Dose: 100·0 mg.

Killed when well: August 13, 1906.

142 days.

P.M.—Softened caseous tumour at seat of inoculation. The adjacent inguinal glands contained caseous nodules. In the liver there was a single grey nodule. One sternal gland contained some calcareous foci.

II.—June 14, 1905.

Strain derived from original material. Total duration of artificial cultivation, 97 days
The 5th generation of culture was used, 21 days old.

PIG 106.

Subcutaneous

Dose: 5·0 mg.

Killed when well: January 15, 1906.

215 days.

P.M.—Healed ulcer at seat of inoculation. The adjacent inguinal glands each contained a cavity filled with soft cheesy material. One portal gland contained a single tubercle. No tuberculosis elsewhere.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
326	Subcut.	5·0 mg.	D. 19 days	Chronic G.T.
328	Subcut.	1·0 mg.	D. 20 „	Local T.

GUINEA-PIGS.

Material.	Number.	Method.	Duration of Life.	Result.
E. of inguinal gland	1857	Intrap.	D. 119 days	G. T.
	1856	Subcut	K. 45 „	Local T.

GUINEA-PIG 2027.

Subcut.

Emulsion of bronchial gland of Guinea-pig 1857.

Died: 44 days.

P.M.—General tuberculosis.

***CULTURE**

Derived from G.P. 1857.

The 4th generation, 22 days old, was used, on November 17, 1906.

RABBITS.

Number	Method.	Dose	Duration of Life.	Result.
1076	Intrav	1·0 mg.	D. 14 days	Acute T.
1077	Intrap	1·0 mg.	D. 19 „	Acute T.
1075	Subcut.	1·0 mg.	D. 37 „	G. T.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life	Result.
2210	Intrap	1·0 mg	D. 11 days	Acute T.
2209	Subcut.	1·0 mg.	D. 35 „	G. T.

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* This culture was mammalian in type and resembled a bovine tubercle bacillus.

VIRUS P II. (Submaxillary Gland of a Pig)—*continued.*

CULTURE INOCULATIONS—*continued.*

IV.—SEPTEMBER 25, 1905.

Strain derived from original material. Total duration of cultivation, 200 days.
The 11th generation of culture was used when 23 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
471	Intrap.	1·0 mg.	D. 34 days	Acute T.
472	Intrap.	0·1 mg.	D. 30 „	Acute T.

CATS.

Number.	Method.	Dose.	Duration of Life.	Result.
62	Intrap.	1·0 mg.	D. 73 days	Numerous T.B. in organs.
64	Subcut.	0·1 mg.	K 134 „	Slight T.

RABBIT 578.
Intravenous.
Inoculation of emulsion of sternal gland of Cat 62.
Died : 19 days.
P.M.—Acute tuberculosis.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
1718	Intrap.	0·1 mg.	D. 94 days	Chronic T.
1717	Subcut.	0·1 mg.	D. 107 „	Local T.

V.—NOVEMBER 30, 1905.

Strain derived from original material. Total duration of artificial cultivation, 266 days.
The 15th generation of culture was used when 21 days old.

MONKEY 118.
Subcutaneous.
Dose : 10·0 mg.
Killed when very ill : March 7, 1906.
97 days.
P.M.—General tuberculosis.

MONKEY 120.
Subcutaneous.
Dose : 1·0 mg.
Killed when well : March 23, 1906.
113 days.
P.M. — Small fibrous lesion at seat of inoculation. Adjacent glands normal. In the lungs were two translucent grey tubercles.

MONKEY 122.
Fed.
Dose : 10·0 mg.
Killed when well : March 22, 1906.
112 days.
P.M.—One mesenteric gland contained a yellow nodule filled with yellow pus. No lesions elsewhere.

MONKEY 124.
Fed.
Dose : 1·0 mg
Killed when well : March 22, 1906.
112 days.
P.M.—In the ileum were two hard grey bodies (? tubercles). Two mesenteric glands contained each a pea-sized collection of creamy pus. No lesions elsewhere.

GUINEA-PIGS.

Material.	Number.	Method.	Duration of Life.	Result.
E. of local lesion.	1930	Subcut.	D. 69 days	G. T.
E. of lung	1927	Subcut.	D. 47 „	G. T.
E. of bronchial gland.	1929	Subcut.	D. 35 „	G. T.
E. of spleen	1928	Subcut.	D. 30 „	G. T.

RABBITS.

Material.	Number.	Method.	Duration of Life.	Result.
E. of lung.	794	Subcut.	D. 82 days	G. T.
E. of spleen.	795	Subcut.	D. 89 „	G. T.

***CULTURE.**
Derived from the spleen. The 11th generation was inoculated on November 16, 1906, when 21 days old, into :

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1060	Intrav.	1·0 mg.	D. 17 days	Acute T.
1059	Intrav.	0·1 mg.	D. 20 „	
1062	Intrap.	1·0 mg.	D. 30 „	G. T.
1061	Intrap.	0·1 mg.	D. 29 „	G. T.
1058	Subcut.	10·0 mg.	D. 63 „	G. T.
1057	Subcut.	1·0 mg.	D. 82 „	G. T.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2200	Intrap.	1·0 mg.	D. 8 days	Acute T.
2198	Intrap.	0·1 mg.	D. 18 „	
2199	Subcut	1·0 mg.	D. 46 „	G. T.
2197	Subcut.	0·1 mg.	D. 46 „	G. T.

FOWL 130.
Fed.
Dose : 20·0 mg.
Killed : 104 days.
P.M.—No tuberculosis.

VI.—FEBRUARY 8, 1906.

Strain derived from original material. Total duration of artificial cultivation, 336 days.
The 19th generation of culture was used, 23 days old.

GOAT 34.
Fed.
Dose : 15·0 mg.
Killed : June 20, 1906.
132 days.
P.M. — One duodenal gland, many mesenteric glands, and the ileo-colic glands showed calcareous tubercles ; in the mesenteric glands they were numerous. In the ileum a few scattered tuberculous foci were seen.

GOAT 36.
Subcutaneous.
Dose : 10·0 mg.
Killed : June 19, 1906.
131 days.
P.M.—Cystic local tumour. In the prescapular gland there was a large caseous partly softened mass. In the lungs and thoracic glands were a few softened caseous nodules, and in the former also some scattered grey tubercles. In one mesenteric gland there was a calcareous tubercle.

***CULTURE**
derived from lung.

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* This culture was mammalian in type.

* This culture was mammalian in type and resembled a bovine tubercle bacillus.

VIRUS P II. (Submaxillary Gland of a Pig)—*continued.*

CULTURE INOCULATIONS—*continued.*

VII.—March 28, 1906.

The strain was derived from the original material. Total duration of artificial cultivation, 438 days.

The 21st generation of culture was used, 21 days old.

FOWLS.

Number.	Method.	Dose.	Duration of Life.	Result.
32	Fed	2 glycerin serum tubes each.	D. 107 days	G. T.
34	Fed		K. 140 "	G. T.

VIII.—May 22, 1906.

Strain derived from original material. Total duration of artificial cultivation, 439 days.

The 24th generation of culture was used, 21 days old.

CALF 424.

Subcutaneous.

Dose : 50·0 mg.

Killed : August 30, 1906.

100 days.

P.M.—Fibrous - walled cyst at seat of inoculation. The left prescapular gland was a cyst filled with caseo-pus and caseonecrotic masses. In the small intestine there were four nodules containing creamy pus.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
883	Subcut.	50·0 mg.	D. 129 days	Slight G. T.
882	Subcut.	1·0 mg.	K. 198 "	S. T.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2035	Subcut.	1·0 mg.	D. 24 days	S. T.
2036	Subcut.	1·0 mg.	K. 198 "	Local T.

VIRUS P II. (Submaxillary Gland of a Pig)—*continued.*

CULTURE INOCULATIONS—*continued.*

IX.—NOVEMBER 28, 1906.

The strain was derived from the original material. Total duration of artificial cultivation, 629 days.

The 26th generation of culture was used, 23 days old.

FOWLS.

Number.	Method.	Dose.	Duration of Life.	Result.
164	Intrap.	10·0 mg.	D. 61 days	G. T.
160	Intrap.	1·0 mg.	D. 40 „	G. T.
162	Subcut.	10·0 mg.	D. 61 „	G. T.
158	Subcut.	1 0 mg.	D. 108 „	G. T.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1131	Fed	10·0 mg.	D. 76 days	S. T.
1132	Fed	1·0 mg.	Killed	No T.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2249	Fed	50·0 mg.	K. 96 days	Local T.
2248	Fed	10 0 mg.	K. 96 „	No T.

X.—JULY 16, 1907.

The strain was derived from the original material. Total duration of artificial cultivation, 2 years, 129 days.

The 31st generation of culture was used, 21 days old.

CALF 556.

Fed.

Dose: about 1000·0 mg.

Killed: Feb. 6, 1908.

205 days.

P.M.—In each of three rectal glands there were from one to three minute opaque soft yellowish foci (culture avian in type). **There was no tuberculosis elsewhere.**

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2575	Subcut.	10·0 mg.	K. 193 days	Local T.
2576	Subcut.	10·0 mg.	K. 193 „	Local T.

PIG 104. Virus P II.

Intraperitoneal inoculation of culture derived from the original material. (An attempt at an intravenous inoculation was made, but this failed, a little of the culture suspension escaping into the tissues around the vein (ear)).

Dose—10·0 milligrammes.

Date—May 4, 1905.

Weight a few days after Inoculation—9·97 kilos. [Age 10 weeks.]

Killed when in good health—July 12, 1905. [69 days after inoculation.]

Clinical Notes.

A small nodular swelling developed at the seat of inoculation near the umbilicus. The pig showed no sign of ill health during the experiment.

Tuberculin Test.

June 30, 1905. [57 days after inoculation.] Doubtful reaction. Rise of temperature, 0·6° C.

Weights.

	Kilos
May 10, 1905...	9·97
May 30, 1905...	12·70
June 27, 1905	16·78
July 11, 1905...	19·05

Gain in weight.—9·08 kilos.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—In the deep subcutaneous tissues of the abdominal wall, near the umbilicus, situated in the track of the injection needle, there was an irregular nodule the size of a French bean, composed of opaque yellowish white, slightly gritty caseous material. In the subperitoneal fat near the latter there were three or four pinhead-sized yellow tubercles.

Inguinal Glands } Normal.
Precrural Glands }

Abdomen.

Omentum.—The omentum was not thickened nor retracted ; it contained moderately numerous spherical opaque yellow nodules, ranging in size from 1 millimetre or less up to about 2·5 millimetres in diameter ; most of these had a narrow translucent peripheral zone, from which on section a firm cheesy-looking mass could be readily shelled.

Peritoneum.—In the peritoneum, between the coils of the large intestine (and to a less extent on that covering the gut), there were numerous similar nodules ; these in several places were closely aggregated, forming long continuous rows. On section they were uniformly caseous, and many appeared to be very slightly gritty in the centre. Stretching from coil to coil of the large intestine were many fine strands of fibrinous material ; the serous surface of the large intestine was slightly roughened.

On the meso-rectum there were several yellow nodules, mostly small, and tending to occur in little groups.

Mesentery.—Normal.

Parietal Peritoneum.—The parietal peritoneum on the left side was thickened and velvety, and showed when removed and placed under water long delicate villous processes. On this same side were four loosely attached flattened nodules, two the size of split peas and two that of millet seeds ; the former were dark in colour, and seemed to have had recent hæmorrhage into their substance.

On the right side of the abdomen there was a slight roughening of the peritoneum near the liver, but there were no nodules.

Bladder.—On the serous surface of the bladder there were three millet seed sized yellow tubercles.

Spleen.—Normal.

Liver.—The anterior surface of the liver was roughened, and showed about half a dozen yellow tubercles, the largest the size of a millet seed ; these indented, but did not penetrate, the liver substance. Embedded in one of the thin margins of the middle lobe was a series of six similar tubercles (these probably began as surface tubercles). On section the liver substance was normal to the eye.

Portal Glands.—Normal.

Kidneys.—The left kidney showed on the surface scattered translucent grey foci ; similar foci were seen on the surface of the right kidney.

Suprarenal Bodies.—Normal.

Coeliac Glands.—The coeliac glands, five in number, were moderately enlarged. On section their tissue was extensively replaced by yellowish white somewhat translucent tissue, showing a sprinkling of minute gritty points ; the caseated tissue was brittle, and in places beginning to break down.

Lying near the vertebral column there was a gland (lumbar gland ?) the size of a pigeon's egg, which on section was caseous and softened practically throughout.

A gland in the pancreas was enlarged, indurated, and showed irregular yellow foci scattered throughout.

Stomach.—Normal.

Large Intestine and Small Intestine.—Mucous membrane normal.

Mesenteric Glands.—The glands generally appeared a little enlarged, and felt firmer than normal. Those in the anterior part (the first five or six) and the terminal gland were beset with irregular yellow foci and streaks ; the rest showed obscure whitish foci, sometimes yellowish streaks. Most of the glands had a peculiar blanched or tallowy appearance, quite unlike that of a normal gland.

Gastric Glands.—A gastric gland contained a yellow tubercle.

Colic Glands.—The colic glands were not enlarged ; they showed scattered foci, the largest the size of a pin's head.

Rectal Glands.—One of the rectal glands contained a minute yellow focus.

Thorax.

Heart and Pleura.—Normal.

Lungs.—The lung tissue was speckled with minute foci of congestion. In the caudal lobes some of the foci under the pleura had a greyish appearance, resembling early tubercles. On the dorsal surface of the left caudal lobe, under the pleura, there were two greyish translucent nodules 1·5 millimetre in diameter ; there was a similar nodule in the right caudal lobe.

Bronchial Glands.—One on the right side showed a minute yellowish point in the depth ; the rest were normal.

Mediastinal Glands.—The long posterior mediastinal gland was enlarged, indurated, and showed irregular yellow tubercles, which at one part of the cortex had become confluent ; in the latter signs of very early calcification were seen.

Pharynx, Larynx, Trachea, and Tonsils.—Normal.

Left Ear.—In the tissues around one of the small veins there was a small irregular yellow patch of necrosis.

A gland near the articulation of the jaw, on the left side, contained two small yellow foci.

A gland near the entrance to the thorax, lying in the mid line on the under surface of the trachea, showed discrete yellow pinhead-sized tubercles scattered throughout the cortex.

All other lymphatic glands were normal.

Microscopical Examination.

(Smear preparations.)

Omental Nodule ... ... *Subcutaneous Nodule* (abdominal)	Numerous tubercle bacilli.
Colic Gland ... ... *Gland at Entrance to Thorax* *Gland at Base of Left Ear* ...	Moderately numerous tubercle bacilli.

Bronchial Gland.—No tubercle bacilli.

Rectal Gland.—A few tubercle bacilli.

PIG 106. Virus P II.

Subcutaneous inoculation of culture derived from the original material.

Dose—5·0 milligrammes.

Date—June 14, 1905.

Weight at Inoculation—14·51 kilos. [Age about 15 weeks.]

Killed when in good health—January 15, 1906. [215 days after inoculation.]

Clinical Notes.

A small tumour developed at the seat of inoculation near the umbilicus, ulcerated and finally disappeared. The animal showed no symptom of illness during the experiment.

Temperature.

The temperature was not recorded for three months following the inoculation. During October there was a slight rise of temperature lasting three weeks and reaching a maximum of 39·6° C. From October 29, 1905, to January 15, 1906, it was normal.

Tuberculin Tests.

September 20, 1905. [98 days after inoculation.] Slight reaction. Rise of temperature, 0·7° C.

November 17, 1905. [156 days after inoculation.] Reacted. Rise of temperature, 1·0° C.

Weights.

	Kilos.
June 14, 1905	14·51
January 15, 1906	51·69

Total gain in weight.—37·18 kilos.

During the first four weeks there was a gain of 3·37 kilos.; then for six weeks the weight was practically stationary (gained 1·36 kilos. only), subsequently there was a progressive increase.

The average gain of weight per week was 1·19 kilos.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—At the seat of inoculation just above the umbilicus there was a shallow healed ulcer about 1 cm. in diameter, over which arched a narrow band of skin the extremities of which were attached to the margins of the ulcer; the space between this band and the ulcer was filled with a small dry brown mass. On section nothing abnormal was seen in the subcutaneous tissues under the ulcer, but about 2 cm. in front of it there was a yellow slightly gritty tubercle about 1·5 mm. in diameter; there was a similar smaller tubercle under the skin about 5 cm. posterior to the ulcer.

Inguinal Glands.—On the left side the gland nearest the local lesion contained a cavity about 1 cm. in diameter, filled with soft, cheesy, white, slightly gritty material. On the right side the corresponding gland contained a similar, rather larger nodule and a yellow tubercle the size of a pin's head. The other inguinal glands were normal.

Precrural Glands.—Normal.

Abdomen.

Iliac, Lumbar, and Coeliac Glands.—Normal.

Omentum and Peritoneum.—Normal.

Spleen.—Normal.

Liver.—There was a doubtful grey speck in the substance of the liver.

Portal Glands.—One portal gland contained an opaque whitish tubercle about 1·5 mm. in diameter.

Kidneys and Suprarenal Bodies.—Normal.

Thorax.

Heart and Pleura.—Normal.

Lungs.—Normal.

Bronchial and Mediastinal Glands.—Normal.

Alimentary Tract.

Tongue, Pharynx, Tonsils, Larynx and Trachea.—Normal.

Stomach and Intestines.—Normal.

Gastric, Mesenteric, and Colic Glands.—Normal.

Various Lymphatic Glands.

Cervical Glands.—A gland between the thyroid body and the trachea on the left side near the entrance to the thorax, was enlarged and on section yellow, necrotic and partially softened; a smaller gland on the same side just within the thorax contained a small nodule filled with yellow pus. Other cervical glands were normal.

Submaxillary, Retro-pharyngeal, Prescapular, and Prepectoral Glands.—Normal.

Microscopical Examinations.

Smear preparations from the two cervical glands showed numerous streptococcal chains and short plump bacilli stained blue; no tubercle bacilli were seen.

Small Tubercle in Subcutaneous Tissues.—No tubercle bacilli.

Liver (small focus).—No tubercle bacilli.

Portal Gland.—Four tubercle bacilli.

Inguinal Gland.—Numerous tubercle bacilli.

PIG 110. Virus P II.

Fed with culture derived from the original material.

Dose—The growth from seven serum tubes.

Date—August 12, 1905.

Weight at commencement of experiment—23·12 kilos. [Age about 19½ weeks.]

Killed when in good health—January 18, 1906. [159 days after commencement of experiment.]

Clinical Notes.

There was no sign of illness during the experiment.

Temperature.

During the first six weeks following the inoculation the temperature was not recorded. During October there was a slight rise of temperature lasting 25 days (maximum 39·9° C.). From October 27, 1905, to January 15, 1906, it remained normal.

Tuberculin Tests.

September 20, 1905. [39 days after inoculation.] Reacted. Rise of temperature 1·3° C.

November 17, 1905. [97 days after inoculation.] No reaction.

Weights.

	Kilos.
August 15, 1905	23·12
January 18, 1906	72·10

The animal was weighed seven times during the course of the experiment and showed a steady increase in weight. The total increase was 44·45 kilos.; the average weekly increase 1·99 kilos.

POST-MORTEM.

Carcass in good condition.

Alimentary Tract.

Tongue, Tonsils, and Pharynx.—Normal.

Submaxillary Glands.—Each submaxillary gland contained two yellow miliary tubercles, slightly gritty from calcification.

Pharyngeal and Cervical Glands.—Normal.

Stomach.—Normal.

Small Intestine.—The mucous membrane of the long Peyer's patch in the ileum had a finely fissured or cracked appearance (suggesting previous ulceration and almost complete regeneration of the mucous membrane); the substance and the serous surface of the patch were normal. Nothing abnormal was seen in any other part of the intestine.

Large Intestine.—Normal.

Gastric Glands.—Normal.

Mesenteric Glands.—The mesentric glands were slightly enlarged and felt indurated; on section the greater number showed the substance almost completely replaced by dry coarsely granular caseo-calcareous tissue; the glands at the extremities of the mesentery were least affected, several of the terminal glands showing only a few discrete yellow gritty tubercles.

Ileo-colic Glands.—The ileo-colic glands were not enlarged; they contained each a few discrete irregular yellow gritty tubercles, about the size of pins' heads.

Colic Glands.—One colic gland on the first part of the colon contained three tubercles similar to those in the ileo-colic glands; in the rest of the colic glands three somewhat smaller tubercles were seen.

Rectal Gland.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—Normal.

Liver and Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Thorax.

Heart and Pleura.—Normal.

Lungs.—The lungs were crepitant and collapsed normally; in the ventral flap of the left cephalic lobe there was a grey translucent nodule 2·5 mm. in diameter; there was a similar smaller nodule in the right caudal lobe; lungs otherwise normal.

Bronchial and Mediastinal Glands.—Normal.

Various Lymphatic Glands.

Coeliac, Prescapular, Prepectoral, Lumbar, Iliac, Superficial Inguinal, and Precrural Glands.—Normal.

Microscopical Examination.

Mesenteric Gland.—Numerous T.B.

Guinea-pigs Inoculated.

No. 1859 (s) } with emulsion of mesenteric gland
No. 1860 (i) } developed slight tuberculosis only.

PIG 136. Virus P II.

Subcutaneous inoculation of culture derived from the original material through Pig 110 (mesenteric glands).

Dose—100·0 milligrammes.

Date—March 24, 1906.

Weight at Inoculation—18·14 kilos. [Age about 12½ weeks.]

Killed when in good health—August 13, 1906. [142 days after inoculation.]

Clinical Notes.

A small slightly raised tumour developed at the seat of inoculation near the umbilicus, and the adjacent inguinal gland became slightly enlarged.

The pig remained in good health during the period of the experiment.

Temperature.

Normal throughout.

Tuberculin Test.

The pig was not tested subsequent to inoculation.

Weights

	Kilos.
March 24	18·14
April 18	21·31
May 15	24·03
August 13	42·18

Total gain of weight during experiment.—24·04 kilos.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—In the middle line of the abdomen, a few inches in front of the umbilicus, there was a smooth somewhat flattened elastic swelling the size of a pigeon's egg, composed of soft cheesy caseous substance surrounded by a thin capsule of fibrous tissue, smooth and vascular on the internal surface. The tumour was situated in the subcutaneous fat, and was not adherent to the skin. In the fat surrounding the tumour there were a few discrete hard tubercles, the largest the size of a millet seed, composed of dry yellowish white friable substance.

Inguinal Glands.—On the left side the gland nearest the local lesion contained four or five whitish caseous nodules, somewhat irregular in outline, the largest rather larger than a hemp seed; they could be readily shelled out from delicate fibrous capsules and were gritty from calcification chiefly around the margins. The corresponding gland on the right side contained two similar nodules. The rest were normal.

Abdomen

Omentum and Peritoneum.—Normal.

Spleen.—Normal.

Liver.—The liver contained in the substance a grey translucent nodule the size and shape of a barley grain, with a soft whitish centre, slightly gritty from calcification. The liver was otherwise normal.

Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal

Renal, Lumbar, and Iliac Glands.—Normal.

Intestines.—Normal.

Mesenteric Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—The ventral parts of the small anterior lobes showed several lobules collapsed and carnified.

Bronchial and Mediastinal Glands.—Normal.

A gland just above the manubrium sterni, not enlarged, contained a number of minute discrete yellow calcareous particles.

Heart.—Normal.

Tongue, Pharynx, Palate, Tonsils.—Normal.

Eyes.—Normal.

Various Lymphatic Glands.

Submaxillary, Prescapular, Cervical, Prepectoral, Axillary, Popliteal, Precrural.—Normal.

Microscopical Examination.

Nodule from Liver.—No tubercle bacilli seen.

Emulsion of Left Inguinal Gland.—Tubercle bacilli numerous.

CAT 62. Virus P II.

Intraperitoneal inoculation of culture derived from the original material.

Dose—1·0 milligramme.

Date of Inoculation—September 25, 1905.

Died—December 7, 1905. [73 days after inoculation.]

POST-MORTEM EXAMINATION.

Local Lesion.—In the subcutaneous tissues at the seat of inoculation there was a broad-bean sized mass of firm tissue, greyish and somewhat resembling glandular tissue. In the muscle wall near it there was a similar smaller mass.

Abdomen.

Omentum.—The omentum was enormously enlarged and composed of greyish tissue resembling glandular tissue, the whole mass having the appearance of a lipoma; on section the mass was homogeneous throughout, and there were no areas of necrosis or softening.

Pyloric Gland.—The pyloric gland was enlarged and firm, but otherwise unaltered.

In the Small Omentum and in the gastro-splenic omentum there were masses of tissue similar to the omental tumour.

The surface of the Stomach, particularly near the pylorus, was closely covered with semi-transparent, slightly raised flattened granules, the largest about 1 mm. or a little over in diameter.

On the surfaces of the Large and Small Intestines there were numerous granulations similar to those on the stomach, but larger and elongated in the length of the intestine.

On the lower end of the intestine there were larger grey nodules up to a split pea in size made up of substance resembling the thickened omentum.

The Mesentery and Mesocolon showed numerous greyish translucent filmy foci varying in diameter up to about 2 mm., just perceptible as slight thickenings between the finger and thumb.

Mesenteric and Colic Glands.—The mesenteric and colic glands were enlarged and firm, but not necrosed.

Spleen.—The spleen was not enlarged and on section appeared normal.

Liver.—The liver showed a few doubtful minute yellow points, but was otherwise normal in appearance.

Portal Glands.—The portal gland was much enlarged; there was no necrosis.

Kidneys.—Normal.

Coelic, Lumbar and Iliac Glands.—Slightly enlarged; no necrosis.

Inguinal Glands.—The inguinal glands were larger than normal, but were not opaque.

Thorax.

Lungs.—The lungs were congested and crepitant and slightly emphysematous in the anterior lobes, but showed no tubercles.

Bronchial Glands.—Normal.

Sternal Glands.—The sternal glands were greatly enlarged, on section congested and firm but not opaque.

Microscopical Examination.

(Smear preparations.)

Sternal Gland.—Extremely numerous short tubercle bacilli.

Subcutaneous Nodule.—Extremely numerous tubercle bacilli, rather larger than in the sternal gland; the smear resembled in places a pure culture.

Inguinal Gland.—Numerous tubercle bacilli, many in clumps.

Spleen.—Very numerous tubercle bacilli; many large loose clumps and also small spherical clumps of bacilli closely gathered together.

Marrow.—Numerous short tubercle bacilli; a few large loose clumps.

CAT 64. Virus P II.

Subcutaneous inoculation of culture derived from the original material.

Dose—1·0 milligramme.

Date of Inoculation—September 25, 1905.

Killed—February 6, 1906. [134 days after inoculation.]

POST-MORTEM EXAMINATION.

Local Lesion.—In the subcutaneous tissues of the abdominal wall there was an elongated flat thickening, composed of brownish translucent tissue externally and tough opaque white tissue internally.

Inguinal Glands.—The inguinal glands were normal in size and general appearance.

Thorax.

Lungs.—In the right lung under the pleura there was a slightly projecting spherical white tubercle about 1·0 mm. in diameter; this when crushed was found to be softened throughout.

Bronchial and Mediastinal Glands.—Normal.

Abdomen.

Peritoneum, Spleen and Kidneys.—Normal.

Liver.—The liver showed in the substance under the capsule an opaque white tubercle the size of a pin's head.

Portal Glands.—Normal.

Intestines and Mesenteric Glands.—Normal.

All other organs and glands were examined and found to be normal.

Microscopical Examinations.

(Smears from)

Local Tumour.—Numerous tubercle bacilli.

Liver.—A moderate number of tubercle bacilli.

Lung.—No tubercle bacilli.

Left Inguinal Gland.—No tubercle bacilli.

RHESUS MONKEY 118. Virus P II.

Subcutaneous inoculation of culture derived from the original material.

Dose—10·0 milligrammes.

Date—November 30, 1905 [Age—Young adult.]

Killed when very ill—March 7, 1906. [97 days after inoculation.]

Clinical Notes.

Fifteen days after the inoculation between the shoulders, there was a softened ill-defined swelling slightly raised above the surface, 3·7 cm. in greatest diameter.

On the 22nd day there was a tense fluctuating local tumour measuring 5 by 3·5 cm., and about 2 cm. in thickness. The axillary glands were slightly enlarged. Up to this time there had been no change in the general condition of the animal.

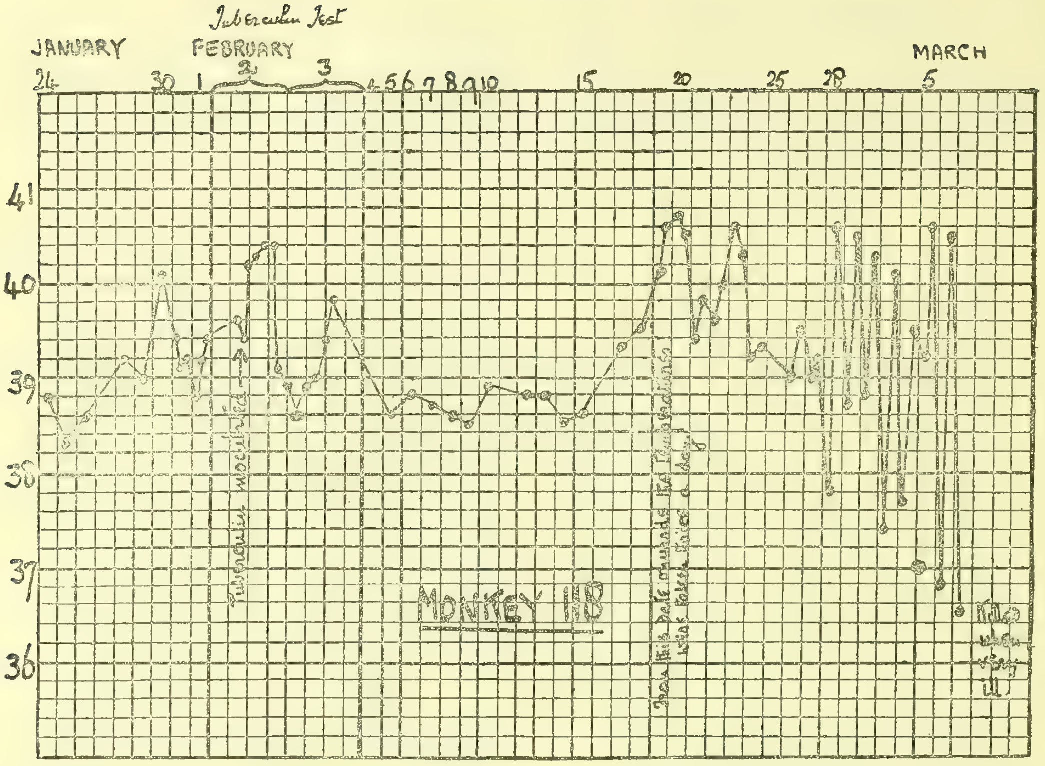
On the 25th day the tumour burst, discharging a yellowish-brown purulent matter.

On the 36th day the tumour was the size of a hen's egg and there were two small openings in the skin, one of which was discharging; there was a group of slightly enlarged glands in each axilla.

On the 87th day the monkey was first noticed to be really ill; its appetite was poor and the respiration increased. For several weeks previously the monkey had been observed to be gradually becoming smaller and thinner.

Six days later its condition was much worse; the respirations were quick and jerky, and the appetite very poor. On the 97th day it was killed; it would probably not have lived more than two or three days longer.

Temperature.



From the commencement of the experiment to January 23, 1906, a period of eight weeks, the temperature remained approximately normal. The subsequent temperatures are given in the chart.

Tuberculin Test.

February 2. [64 days after inoculation.] Reacted. Rise of temperature, 0·8° C.

POST-MORTEM EXAMINATION.

Local Lesion.—In the subcutaneous tissues over the upper lumbar vertebrae there was a small flattened extremely thin-walled cavity containing two tough yellowish caseous masses and a small quantity of caseo-pus. The inner surface of the cyst was smooth and shiny

Axillary Glands.—An axillary gland on each side contained one soft greyish white tubercle about 1·5 mm. in diameter.

Prepectoral Glands.—Normal.

Thorax.

Lungs.—On opening the thorax the right middle and lower lobes were found to be enlarged and to fill the lower part of the right pleural cavity; the right lung was adherent to the chest wall chiefly on its lower dorsal and diaphragmatic surfaces; the parietal pleura in these regions was thickened, and showed a honeycombed surface.

On section the greater part of the right lung was firm, airless, and in a condition of caseous pneumonia; the posterior portion of the right caudal lobe was uniformly caseous, but in the anterior part and in the right middle lobe, chiefly around the margins, there was a small amount of dark red consolidated lung tissue surrounding the caseous patches; at the apex of the caudal lobe there was a small amount of air-containing tissue and the anterior lobe was crepitant throughout; the latter was intimately adherent to the middle lobe. The crepitant portions of the lung contained firm discrete greyish yellow tubercles ranging from 1 to 2 mm. in diameter.

The left lung collapsed normally and contained moderately numerous firm discrete caseous nodules ranging in size from 1 to nearly 3 mm. in diameter; the ventral flap of the anterior lobe was consolidated, and showed on section firm yellow caseous nodules closely aggregated together and surrounded by dark red collapsed lung tissue.

Thoracic Glands.—The bronchial glands on the right side were greatly enlarged and caseous throughout.

The intertracheo-bronchial glands showed the greatest degree of enlargement and were fused together. On section the caseous substance was beginning to break down, forming greenish yellow pus, chiefly around the periphery of the gland.

On the left side a praetracheo-bronchial gland, the size of a small bean, was more than half caseous and softened; one small intertracheo bronchial gland was normal.

The sternal glands showed soft caseous tubercles.

Pleura.—In the intercostal spaces on the right side near the sternum there was a series of firm caseous nodules, the largest the size of a kidney bean; near the diaphragm were several prominent yellow caseous tubercles.

Vertebral Glands.—Two vertebral glands on the right side, in the posterior interspaces, contained each one or two soft pinhead-sized caseous foci.

Marrow.—The marrow of the femur and tibia contained moderately numerous soft yellow tubercles, mostly about 1·0 or 1·5 mm. in diameter, but some were larger.

Abdomen.

There was no fluid in the peritoneal cavity.

Omentum.—The omentum contained a few scattered greyish-white opaque tubercles 1 to 1·5 mm. in diameter and a number of minute transparent tubercles.

Spleen.—The spleen was slightly enlarged, and crowded with soft yellowish white nodules with thin capsules, the largest 5 mm. in diameter.

Splenic Glands.—Two splenic glands contained each one or two small opaque whitish tubercles.

Liver.—The liver was displaced by the enlarged right lung and was closely beset with firm discrete opaque white tubercles ranging in size from a mere speck up to 2 mm. in diameter; the majority were small and about 0·5 mm. in diameter

Portal Glands.—In the hilum of the liver there were two slightly enlarged glands; one contained a number of discrete soft yellowish white tubercles up to a little over 1 mm. in diameter; the other contained only two or three.

Coeliac Glands.—Two slightly enlarged coeliac glands showed arranged around the cortices a number of soft yellow purulent nodules, 1 to 2 mm. in diameter, in one gland becoming confluent.

A precardial gland contained two yellowish soft tubercles.

Kidneys.—Each kidney showed in the cortex, on the surface and in the depth, numerous opaque yellowish-white tubercles ranging in size from 1 to 1·5 mm. in diameter; many of the tubercles projected from the surface. The medullary zone and pelvis were normal.

Suprarenal Bodies.—The right suprarenal body contained two opaque miliary tubercles. The left was normal.

Iliac Glands.—A gland on the left side, on the ramus of the pubis, contained three soft yellow nodules, the largest 1·5 mm. in diameter. Other glands in this region were normal.

Lumbar Glands.—Normal.

Alimentary Tract.

Tonsils, Pharynx, and Larynx.—Normal.

The Submaxillary and Submental Glands were normal.

Retro-pharyngeal Glands.—The right retro-pharyngeal gland contained a nodule about 2·5 mm. in diameter filled with yellow pus. The left was normal.

Parotid Salivary Gland.—In the parotid salivary gland lying over the insertion of the masseter muscle there was a firm whitish nodule, 2·0 mm. in diameter, beginning to soften.

Cervical Glands.—Normal.

Intestines.—Normal.

Mesenteric Glands.—Two mesenteric glands contained each a soft yellow nodule about 3 mm. in diameter. Other mesenteric glands were normal.

Colic Glands.—Two colic glands on the ascending colon were slightly enlarged and partly caseous; the rest of the colic glands were normal.

Testes.—Normal.

In the subcutaneous tissues of the abdominal wall there were scattered firm spherical tubercles ranging up to nearly 2 mm. On section they were opaque, white, and some were softened.

There was a soft greyish white tubercle (1·5 mm.) in the right latissimus dorsi muscle.

Brain.—Normal.

MONKEY 120. Virus P II.

Subcutaneous inoculation of culture derived from the original material.

Dose—1·0 milligramme.

Date—November 30, 1905. [Age—Young adult.]

Killed when in good health—March 23, 1906. [113 days after inoculation.]

Clinical Notes.

Fifteen days after the inoculation between the shoulders there was a small local tumour not so large as a broad bean.

On the 36th day there was a soft fluctuating tumour half the size of a pigeon's egg, the axillary glands were slightly enlarged.

The tumour subsequently burst and discharged, and the ulcer afterwards healed, the tumour being represented by a patch of thickening. The monkey was killed on the 113th day. It had shown no definite symptoms of ill health, but it appeared to have become a little thinner and smaller during the experiment.

Temperature.

The temperature remained normal throughout, the maximum range of variation during a period of three months being only 37·7° C.–39·3° C. (1·6° C.).

Tuberculin Test.

February 2. [64 days after inoculation.] Reaction. Rise of temperature 0·9° C.

POST-MORTEM EXAMINATION.

Local Lesion.—At the seat of inoculation there was a thin patch of fibrous thickening, the size of a sixpenny piece; the fibrous tissue was congested.

Axillary and Inguinal Glands.—Normal.

Liver, Kidneys, and Suprarenal Bodies.—Normal.

Spleen.—The spleen was normal in size; the malphigian bodies were very conspicuous but showed no sign of necrosis (no tubercle bacilli found).

Thorax.

Lungs.—The lungs were crepitant and collapsed normally; they showed under the pleura two translucent grey tubercles, 1·5 mm. in diameter, with minute opaque yellow centres.

In the left caudal lobe there was a loculated bronchiectatic cavity, with smooth shining walls, containing a small quantity of yellow pus (this showed no tubercle bacilli but several elliptical bodies resembling ova); the pleura over the cavity showed a depressed scar. Rest of lung normal.

Bronchial Glands.—Normal.

Neck Glands, Pharynx, and Tonsils.—Normal.

Portal, Coeliac, Lumbar, and Iliac Glands.—Normal.

Microscopical Examination.

No tubercle bacilli were found in the spleen nor in the pus from the lung.

MONKEY 122. Virus P II.

Fed with culture derived from the original material.

Dose—About 10·0 milligrammes.

Date—November 30, 1905. [Age—Young adult.]

Killed when in good health—March 22, 1906. [112 days after feeding.]

Clinical Notes.

The monkey remained well during the experiment.

Temperature.

The temperature remained approximately normal throughout, with the exception of one week (January 28 to February 3), during which it was slightly raised, the maximum being 39·8° C.

Tuberculin Test.

February 2, 1906. [64 days after feeding.] No reaction Rise of temperature 0·3° C.

POST-MORTEM EXAMINATION.

Body in very good condition.

Alimentary Tract.

Tongue, Tonsils, Larynx, and Pharynx.—Normal.

Submaxillary, Pharyngeal and Cervical Glands.—Normal.

Stomach, Small and Large Intestines.—Normal.

Mesenteric Glands.—One mesenteric gland contained in the centre a yellow nodule, filled with soft pus, about 2 mm. in diameter ; other mesenteric glands were normal in size and appearance.

Ileo-colic and Colic Glands.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen, Liver, Kidneys, and Suprarenal Bodies.—Normal.

Portal, Lumbar, and Iliac Glands.—Normal.

Testes.—Normal.

Thorax.

Heart and Pleura.—Normal.

Lungs.—The lungs were normal except for two or three cysts with fibrous walls containing a few parasites.

Bronchial Glands.—Normal.

Microscopical Examination.

Pus from Mesenteric Gland.—No tubercle bacilli.

MONKEY 124. Virus P II.

Fed with culture derived from the original material.

Dose—1·0 milligramme.

Date—November 30, 1905. [Age—Young adult.]

Killed when in good health—March 22, 1906. [112 days after feeding.]

Clinical Notes.

The monkey remained well during the experiment.

Temperature.

The temperature remained approximately normal throughout.

Tuberculin Test.

February 2, 1906. [64 days after feeding.] Reacted. Rise of temperature, 0·8° C.

POST-MORTEM EXAMINATION.

Body in very good condition.

Alimentary Tract.

Tongue, Tonsils, Larynx, and Pharynx.—Normal.

Submaxillary, Pharyngeal, and Cervical Glands.—Normal.

Stomach and Large Intestine.—Normal.

Small Intestine.—The small intestine showed in the ileum under the mucous membrane two small hard bodies which on section were grey and translucent.

Mesenteric Glands.—Two mesenteric glands contained each a collection of creamy white pus, the size of a small pea ; between the peritoneum and another gland there was a small quantity of pus which could be moved about under the membrane by pressure. Other glands were normal in size and appearance.

Ileo-colic and Colic Glands.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen, Liver, Portal Glands, Kidneys, and Suprarenal Bodies.—Normal.

Lumbar, Iliac, and Bronchial Glands.—Normal.

Thorax.

Lungs.—The lungs were normal except for one parasitic cyst.

Heart and Pleura.—Normal.

Testes.—Normal.

Microscopical Examination.

Pus from Mesenteric Gland.—No tubercle bacilli.

GOAT 34. Virus P II.

Fed once with culture derived from the original material.

Dose—15·0 milligrammes.

Date—February 8, 1906. [Age about 1 year.]

Killed—June 20, 1906. [132 days after inoculation.]

Clinical Notes.

The animal remained in good health during the experiment.

Temperature.

On March 5, 25 days after inoculation, the temperature rose to 39·6° C., but quickly fell to normal. With this exception the temperature was normal throughout.

Tuberculin Test.

May 31, 1906. [112 days after inoculation.] Reacted. Rise of temperature, 1·4° C.

Weights.

	Kilos.
February 21, 1906	22.22
March 20, 1906	19·95
April 18, 1906	16·78
May 15, 1906...	16·32
June 20, 1906	15·87

Total loss of weight during experiment.—6·35 kilos.

POST-MORTEM EXAMINATION.

Condition fair.

Tongue, Tonsils, and Pharynx.—Normal.

Submaxillary, Retro-pharyngeal, and Cervical Glands.—Normal.

Thyroid Body.—Normal.

Abdomen.

Omentum.—Normal.

Peritoneum.—The peritoneum covering the left side of the diaphragm and the serous surface of the stomach was roughened with numerous small connective tissue tags.

Intestines.—The mucous membrane of the ileum showed some scattered greyish yellow foci, which resembled solitary follicles; otherwise the small intestine was normal. Large intestine appeared normal.

Gastric Glands.—Normal.

A gland on the first part of the duodenum showed in the cortex a yellowish white calcareous tubercle the size of a millet seed and two or three calcareous grains.

Mesenteric Glands.—Several small glands in the anterior part of the mesentery were normal; all the others were normal in size, but showed in the cortices just under the capsule numerous irregular yellow calcareous tubercles ranging in size from a mere point to that of a hemp-seed; they were most numerous in the large terminal gland.

Ileo-colic Glands.—The ileo-colic glands, not enlarged, contained a few irregular yellow calcareous tubercles, the largest the size of a millet seed.

Colic Glands.—Normal.

Spleen.—Normal.

Liver.—Normal.

Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Thorax.

Lungs.—The right lobes showed large patches of recent hæmorrhage; in the left lobes there were some small hæmorrhagic patches. In the thin posterior borders of the caudal lobes there were a few small parasitic nodules. No tubercles were seen anywhere.

Bronchial and Mediastinal Glands.—Normal.

Heart and Pleura.—Normal.

Precrural, Pudic, Lumbar, Iliac, Prescapular, Prepectoral, and Axillary Glands.—Normal.

Mammary Gland and Uterus.—Normal.

Microscopical Examinations.

(Smear Preparations.)

Duodenal Gland }
Ileo-Colic Gland } A few tubercle bacilli.

Small Intestine (yellow foci).—A few tubercle bacilli.

GOAT 36. Virus P II.

Subcutaneous inoculation of culture derived from the original material.

Dose—10·0 milligrammes.

Date—February 8, 1906. [Age—Old adult.]

Killed when in good health—June 19, 1906. [131 days after inoculation.]

Clinical Notes.

For two or three days after inoculation the goat was unwell, lay with its head under the manger and ate very little food. On February 19 she aborted.

On February 22 the tumour at the seat of inoculation measured 7·5 by 4·5 cm. by about 2·5 cm. thick. The right prescapular gland was slightly enlarged, 5 cm. in length. The goat was then quite well.

Subsequently the tumour became soft and fluctuating; on April 10 it was egg shaped, measuring 9 cm. in long diameter. The prescapular gland was 5 cm. in length. The goat was quite well.

No further changes were noted in the local conditions.

The goat remained well during the remaining period of the experiment.

Temperature.

On the 5th day after inoculation the temperature rose to 39·6° C. and reached 40·1° C. on the 8th day; on the 12th day it was again normal, and remained so until the animal was killed.

Tuberculin Test.

May 31, 1906. [112 days after inoculation.] Reacted. Rise of temperature, 1·4° C.

Weights.

	Kilos.
February 21, 1906	40·36
March 20, 1906	40·36
April 18, 1906	38·55
May 15, 1906	39·00
June 19, 1906	29·93

Total loss of weight during experiment.—10·43 kilos.

POST-MORTEM EXAMINATION.

Condition fair.

Local Lesion.—In the subcutaneous tissues on the right side of the neck there was a fluctuating tumour, the size and shape of a hen's egg; on section it was found to be a cyst with a thin fibrous wall and yellowish white softened pultaceous contents; the internal surface of the cyst wall was smooth and shiny, except at one part, where there was a patch of granulation tissue; to the latter there was attached a small irregular firm caseous mass; the skin was lightly adherent to the outer surface of the cyst wall.

Right Prescapular Gland.—The right prescapular gland measured 3·5 by 2 cm. and a little over 1 cm. in greatest thickness; on section it contained a firm pinkish yellow caseous mass, slightly gritty from calcification, replacing about three quarters of the gland substance; the mass had begun to soften around the margins and was almost completely separated from the thin fibrous capsule which surrounded it.

Left Prescapular Gland.—Measured 2·7 by 1 by about 0·5 cm. and was normal on section.

Prepectoral and Cervical Glands.—Normal.

Thorax.

Lungs.—In the left caudal lobe just under the pleura there was a nodule, the size of a hemp seed, with a fibrous wall and soft caseous gritty contents; near the root of this lobe, projecting slightly from the ventral surface, there was an irregular nodular mass, 1 cm. in greatest diameter, composed apparently of several small nodules joined together; on section it showed a pea-sized cavity filled with yellow caseopus and several soft yellow foci surrounded by grey translucent fibrous tissue. In the right middle lobe there was a pea-sized nodule with a fibrous capsule and caseo-purulent contents. In the thin posterior parts of the caudal lobes and under the pleura on the dorsal surface were several firm grey patches, composed apparently of aggregated grey foci (verminous pseudo-tuberculous pneumonia); sparsely scattered over the surface of both lungs just under the pleura were tubercles, varying in size from a mere point to about 1 mm. in diameter; the smaller ones were grey and semitransparent; the larger ones had yellow centres, in some calcareous, in others softened; several of the latter were examined microscopically but no tubercle bacilli were found; these were probably of a parasitic nature.

Thoracic Glands.—The bronchial glands appeared normal.

The long dorsal mediastinal glands contained four firm yellow nodules, composed of a friable caseous substance, one the size of a pea, the other that of a millet seed; all were slightly gritty. The gland immediately anterior to the latter was enlarged and contained two similar nodules, one 1 cm. in diameter, which almost completely replaced the gland substance.

An intra-tracheal gland, the size of a kidney bean, contained two pea-sized caseous nodules fibrous around the margins.

Pleura and Heart.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen.—Normal.

Liver.—Normal.

Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Alimentary Tract.

Tongue, Tonsils, and Pharynx.—Normal.

Submaxlilary, Pharyngeal, and Cervical Glands.—Normal.

Intestines.—Normal.

Mesenteric Glands.—One showed in the cortex a small irregular calcareous tubercle; in the medulla of almost every one of the glands were scattered spherical grey foci, the largest about 1 mm. in diameter, with minute opaque centres (no T.B. found, probably parasitic).

Ileo-Colic and Colic Glands.—Normal.

Various Lymphatic Glands.

Lumbar, Iliac, Precrural, Popliteal, Gluteal, and Pudic Glands.—Normal.

Thyroid Body.—Normal.

Microscopical Examinations.

(Smear Preparations.)

Lung (two large nodules).—Tubercle bacilli easily found in both.

Several small tubercles. No tubercle bacilli.

Mesenteric Glands (calcareous tubercle).—? 1 tubercle bacillus.

„ „ (medullary foci).—No tubercle bacilli.

CALF 424. Virus P II.

Subcutaneous inoculation of culture derived from the original material.

Dose—50·0 milligrammes.

Date of Inoculation—May 22, 1906.

Weight at Inoculation—26·75 kilos. [Age about 5 weeks.]

Killed when in good health—August 30, 1906. [100 days after inoculation.]

Clinical Notes.

Eighteen days after inoculation on the left side of the neck, there was a firm tumour 7·5 by 6·5 cm. by about 2 cm. in greatest thickness; the adjacent prescapular gland was large and hard, 9 cm. in length.

On the 25th day the tumour was firm and prominent, but smaller, measuring 6·5 by 5 cm.; the prescapular gland had also diminished in size, and was now about 7·5 cm. in length.

No further changes of importance took place in the local conditions.

The calf remained in good health during the experiment.

Temperature.

A period of slight pyrexia commenced on the 11th day and lasted 9 days, the maximum temperature being 39·7° C. Subsequently the temperature remained normal.

Tuberculin Test.—The calf was not tested subsequent to inoculation.

Weights.

	Kilos.
May 22	26·75
July 17	45·80
August 30	58·49

Total gain of weight.—31·74 kilos.

Average rate of gain per week.—2·26 kilos

POST-MORTEM EXAMINATION.

General condition good.

Local Lesion.—At the seat of inoculation on the left side of the neck there was an oval tumour measuring 5 by 4·5 by 2·5 cm. On section it was a fibrous walled cyst adherent to, but not infiltrating, skin and muscle. The cavity was lined by pinkish granulation tissue, and contained two caseous, slightly gritty, necrotic masses, surrounded by a glairy purulent fluid.

Left Prescapular Gland.—The left prescapular gland measured 7·5 by 5·0 by 3·8 cm. On section the gland substance had disappeared, and it consisted of a cyst containing caseo-necrotic masses bathed in yellow caseo-pus. There were several fibrous bands stretching across from side to side.

Right Prescapular, Prepectoral and Axillary Glands.—Normal.

Thorax.

Pleura and Heart.—Normal.

Lungs and Thoracic Glands.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Spleen and Liver.—Normal.

Gall Bladder and Portal Glands.—Normal.

Kidneys and Suprarenals.—Normal.

Renal, Lumbar, and Iliac Glands.—Normal.

Alimentary Tract.

Tongue, Pharynx, Palate, Tonsils.—Normal.

Pharyngeal, Submaxillary, Hyoid, and Parotid Glands.—Normal.

Intestines.—In the first part of the small intestine, beneath the mucous membrane of the Peyer's patches, there were four slightly irregular yellowish nodules up to a millet seed in size ; on section they contained a creamy purulent substance.

The large intestine was normal.

Mesenteric, Ileo-Colic, and Colic Glands.—Normal.

Eyes.—Normal.

Testes.—Normal.

Various Lymphatic Glands.

Precrural, Popliteal, Gluteal, Ischiatic, Pudic.—Normal.

Microscopical Examinations.

Nodule from Small Intestine.—Two tubercle bacilli seen.

Left Prescapular Gland.—Tubercle bacilli fairly numerous.

CALF 556. Virus P II.

Fed once with culture derived from the original material.

Dose—1,000·0 milligrammes.

Date of feeding—July 16, 1907. [Age 8 weeks.]

Killed when in good health—February 6, 1908. [205 days after inoculation.]

Clinical History.

The animal showed no sign of ill-health during the course of the experiment.

Temperature.

The temperature was normal throughout.

Tuberculin Tests.

September 18, 1907, [64 days after the experiment began]. Dose of tuberculin (Bovine), 2·0 cc. No reaction.

October 29, 1907, [105 days after the experiment began]. Dose of tuberculin (Avian), 4·0 cc. Rise of temperature 0·9° C.

Weights.

	Kilos.
July 16, 1907...	41·72
February 6, 1908	81·17

Total gain in weight.—39·45 kilos.

POST-MORTEM EXAMINATION.

General condition good.

Liver.—In the substance and just beneath the capsule there were about twelve soft irregular yellowish foci, a few of which were surrounded by slight zones of congestion.

Rectal Glands.—In each of three there were from one to three minute opaque soft yellowish foci.

There was no sign of disease in any other organ or gland in the body.

Microscopical Examinations.

(Smear Preparations.)

Rectal Gland.—No tubercle bacilli.

Liver (focus 1).—No tubercle bacilli.

Liver (focus 2).—No tubercle bacilli.

Culture made from rectal gland was avian in character.

VIRUS P III. (Submaxillary Gland of a Pig)—*continued.*

CULTURE INOCULATIONS—*continued.*

VI.—January 29, 1908.

The strain was derived from the original material, and had been in cultivation a total period of 1,066 days.

The culture used was the 27th generation, 21 days old.

PONY 14.

Fed for 6 days.
Total amount received : 600·0 mg.
Killed : June 15, 1908.
138 days.

P.M.—In one tonsil was a group of caseous gritty foci. Two cervical glands contained caseous gritty lesions, four others were slightly affected. Nine mesenteric and the colic glands contained caseous gritty nodules. There were a few translucent tubercles and two yellow nodules in the lungs, a moderate number of translucent tubercles in the liver, and calcareous streaks and nodules in the omentum. In the muscle on the left side of the neck there was a small fibro-caseous thickening.

GUINEA-PIGS.

Material.	Number.	Method.	Duration of Life.	Result.
E. of colic gland.	3203	Intrap.	K. 100 days	Local T.
E. of lung	3202	Intrap.	K. 100 „	No. T.
E. of liver	3200	Intrap.	D. 10 „	S. T.
	3201	Intrap.	K. 100 „	No. T.

GOAT 58.

Intravenous.
Dose : 1·0 mg.
Died : March 4, 1908.
35 days.
P.M.—Acute tuberculosis.

GOAT 56.

Intravenous.
Dose : 10·0 mg.
Died : March 9, 1908.
40 days.
P.M.—Acute tuberculosis.

FOWLS.

Number.	Method.	Dose.	Duration of Life.	Result.
348	Intrav.	0·01 mg.	D. 54 days	G. T.
346	Intrav.	0·001 mg.	D. 97 „	G. T.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1617	Intrav.	0·01 mg.	K. 23 days	T.B. in organs.
1616	Intrav.	0·001 mg.	D. 166 „	Chronic G. T.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2969	Subcut.	10·0 mg.	D. 36 days	Local T.
2970	Subcut.	10·0 mg	D. 39 „	Local T.

VIRUS P III. (Submaxillary Gland of a Pig).

CULTURE INOCULATIONS.

I.—June 17, 1905.

Strain derived from original material. Total duration of cultivation, 100 days. The 5th generation of culture was used, 21 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life	Result.
334	Intrav.	1·0 mg.	D. 17 days	Acute T.
331	Intrap.	5·0 mg.	D. 9 „	

CALF 282.
Inoculation into sheath of jugular vein.
Dose: 10·0 mg.
Killed: July 4, 1905.
17 days.

P.M.—Fibroid tumour surrounding the jugular vein at seat of inoculation. The adjacent cervical glands were largely composed of translucent tissue and a yellow network; other glands in the neighbourhood were less severely affected. No definite tuberculous lesions were seen elsewhere.

GUINEA-PIGS.

	Number.	Method.	Duration of Life	Result.
E. of spleen	1612	Subcut	D. 150 days	Local T. Bronchial gland enlarged, caseous, and softening.
	1613	Intrap.	D. 133 „	Local T. only.

GUINEA-PIG 1901.
Subcutaneous.
Inoculated with culture derived from G.-P. 1613.
Killed: 34 days.

GUINEA-PIG 1976.
Subcutaneous.
Inoculated with culture derived from G.-P. 1901.
Killed: 107 days.

P.M.—Purulent nodule in inguinal gland. No tuberculosis elsewhere.

***CULTURE**
Derived from G.-P. 1612. The 3rd generation, 20 days old, was used on March 20, 1906.

RABBITS.

Number.	Method	Dose.	Duration of Life.	Result.
799	Intrav.	1·0 mg.	D. 94 days	Chronic G. T.
801	Intrap.	1·0 mg.	K. 141 „	
798	Intrap.	0·1 mg.	K. 141 „	
802	Subcut.	10·0 mg.	K. 141 „	Slight T.
800	Subcut.	1·0 mg.	K. 141 „	

CALF 392.
Subcutaneous.
Dose: 50·0 mg.
Killed: June 22, 1906.
94 days.

P.M.—Thin-walled cyst with caseo-purulent contents at seat of inoculation. In the left prescapular gland were four calcareous nodules. In the thoracic glands a few minute yellow points were seen.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
1939	Intrap.	1·0 mg.	D. 14 days	G. T.
1941	Intrap.	0·1 mg	D. 22 „	
1938	Subcut.	1·0 mg.	D. 30 „	
1940	Subcut.	0·1 mg.	D. 17 „	Early G. T.

FOWL 30.
Fed: 25·0 mg.
Killed: 65 days.
P.M.—No tuberculosis

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
1594	Intrap.	5·0 mg.	D. 9 days	Acute T.
1593	Subcut. partly Intrap.	5·0 mg.	D. 15 „	

FEEDING EXPERIMENT WITH CULTURE, COMMENCING ON JULY 25, 1905.

Strain derived from original material. Total duration of artificial cultivation, 138 days. The 8th generation of culture was used.

PIG 112.
Feeding.

Fed for seven days with culture, the growth from one tube being used each day.

Killed when well: September 14, 1905.
51 days.

P.M.—The left submaxillary glands were enlarged and hard; in one a minute focus was seen. The small intestine contained numerous shallow ulcers showing neither congestion nor caseation (smear, T.B.). The mesenteric and ileo-colic glands were enlarged and mottled with whitish streaks and foci.

GUINEA-PIG 1691.
Intraperitoneal.
E. of mesenteric gland.
Died: 17 days.
P.M.—Acute tuberculosis (avian type).

RABBIT 379.
Intravenous.
Inoculated with small dose on July 27, 1905.
Died: 22 days.
P.M.—Acute tuberculosis

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* This culture was mammalian in type and resembled an easy-growing human bacillus.

VIRUS P III. (Submaxillary Gland of a Pig)—*continued.*

CULTURE INOCULATIONS.

II.—September 7, 1905.

Strain derived from original material. Total duration of cultivation, 182 days.

The 10th generation of culture was used, 21 days old.

RATS.

Number.	Method.	Dose.	Duration of Life.	Result.
79	Intrap.	1·0 mg.	D. 219 days	Numerous T.B. in organs.
80	Subcut.	5·0 mg.	D. 167 "	T.B. in spleen and liver.
78	Subcut.	1·0 mg.	D. 183 "	Local T. A few T.B. in lung and spleen.

CALF 318.

Subcutaneous.

Dose : 50·0 mg.

Killed : December 11, 1905.

95 days.

P.M.—Fibrous - walled cyst at seat of inoculation. The left prescapular gland was largely caseo-necrotic and softened. Two tubercles were seen in the lungs. In the heart muscle was one small gritty nodule. Most of the lymph glands contained one or more small tubercles usually caseous and softened. In the small intestine were several greyish red nodules, the majority ulcerated, and a few soft yellow tubercles.

CATS (Kittens).

Number.	Method.	Dose.	Duration of Life.	Result.
60	Intrap. and partly Subcut.	5·0 mg.	D. 16 days	Acute T. Numerous T.B. in organs.
56	Intrap.	1·0 mg.	D. 16 "	Numerous T.B. in Spleen.
54	Subcut.	1·0 mg.	D. 14 "	Numerous T.B. in nearest glands.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
443	Intrav.	1·0 mg.	D. 21 days	Acute T.
444	Intrav.	0·01 mg.	D. 41 "	

GUINEA-PIGS.

	Number.	Method.	Duration of Life.	Result.
E. of prescapular gland.	1798	Intrap.	D. 21 days	Local T.
	1797	Subcut.	D. 43 "	Local T.
E. of spleen	1795	Intrap.	D. 23 "	No T.
E. of mesenteric gland.	1796	Subcut.	D. 20 "	No T.

CULTURE INOCULATIONS.

April 25, 1907.

The strain was derived from the prescapular gland of Calf 318 and had been in cultivation a total period of 500 days.

The culture used was the 7th generation, on glycerin-broth, 142 days old.

CALF 530.

Subcutaneous.

Dose : 5000·0 mg.

Killed : October 10, 1907.

168 days.

P.M.—There were six caseo-purulent nodules at the seat of inoculation up to a sparrow's egg in size, and no tuberculosis elsewhere.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2448	Subcut.	200·0 mg.	K. 113 days	Local T. only.
2447	Subcut.	100·0 mg.	K. 113 "	
2446	Subcut.	1·0 mg.	K. 113 "	

FOWL 238.

Intraperitoneal.

Dose : 1·0 mg.

Died : 147 days.

P.M.—No tuberculosis.

III.—April 12, 1906.

The strain was derived from the original material and had been in cultivation a total period of 399 days.

The culture used was the 18th generation, 15 days old.

MONKEY 134.

Subcutaneous

Dose : 10·0 mg.

Killed : August 21, 1906

131 days.

P.M.—At the seat of inoculation was a small cicatrix. Adjacent glands normal. On the wall of the caceum were two cysts containing caseo-purulent matter ; on the mucous surface opposite one was a minute ulcer, and the wall was infiltrated. No tuberculosis elsewhere

DOG 122 (Puppy).

Subcutaneous.

Dose : 25·0 mg.

Killed : 74 days.

P.M.—Flattened cavity containing fluid and lined by granulation tissue in subcutaneous tissue. A few T.B. in lungs and liver.

IV.—August 22, 1906.

The strain was derived from the original material and had been in cultivation a total period of 561 days.

The culture used was the 21st generation, 23 days old.

FOWLS.

Number.	Method.	Dose	Duration of Life.	Result.
102	Intrav.	10·0 mg.	D. 29 days	G.T.
100	Intrav.	1·0 mg.	D. 33 "	G.T
98	Intrav.	0·1 mg.	D. 41 "	G.T.

V.—November 28, 1906.

The strain was derived from the original material, and had been in cultivation a total period of 659 days.

The culture used was the 20th generation, 21 days old.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2251	Fed	50·0 mg.	K. 96 days	No T
2250	Fed	10·0 mg.	K. 96 "	No T.

RABBIT.

Number.	Method.	Dose	Duration of Life.	Result.
1133	Fed	10·0 mg.	D. 42 days	Local T.

CALF 282. Virus P III.

Inoculation into the sheath of the jugular vein of culture derived from the original material.

Dose—10·0 milligrammes.

Date—June 17, 1905.

Weight at Inoculation—37·64 kilos. [Age about 7 weeks.]

Killed when apparently in good health—July 4, 1905. [17 days after inoculation.]

Clinical Notes.

A hard swelling developed in the sheath of the jugular vein and completely surrounded it.

Temperature.

The temperature rose to 39·8° C. on the 3rd day after inoculation and reached 40·5° C. on the 10th day. The following day the temperature was normal. Tuberculin was then inoculated in a dose of 1·5 cc. and the temperature rose to 40·1° C., a rise of 0·6° C.

Weights.

	Kilos.
June 27	37·64
July 4	35·37

Loss in weight.—2·27 kilos.

POST-MORTEM EXAMINATION.

Local Lesion.—In the deep tissues of the neck, on the right side, there was an elongated tumour 10 by 5 by 4 cm., almost cartilaginous in hardness. On removal and section it was found to surround the right jugular vein, which ran through its centre, and to consist of very dense, somewhat translucent, fibroid tissue, showing here and there yellow necrotic streaks. The jugular vein in the middle of the tumour was constricted, and it was filled above and to a certain extent below with red blood clot.

Cervical Glands.—A long narrow gland (one and a half inches in length), situated near the tumour, showed about half the substance composed of firm grey translucent tissue, penetrated with a firm yellow network. The rest of the gland seemed firmer than normal, but no opaque foci were visible. The right superior cervical, the size of a broad bean, was similarly affected. A gland, the size of a sparrow's egg, situated between the latter two, was indurated, and composed throughout of grey translucent tissue showing signs of early necrosis.

On the left side a mid cervical gland was a little enlarged and firmer than normal; no necrotic foci were seen.

Other left cervical glands were normal.

Right Prescapular Gland.—The right prescapular gland was a little larger than the left. Near the superior extremity there was an indurated patch in the cortex, which showed a few extremely minute yellowish points.

Left Prescapular Gland.—Normal.

Prepectoral Glands.—The right spherical prepectoral gland was enlarged (1 centimetre in diameter), and indurated. Other prepectoral glands were normal.

Axillary Glands—Normal.

Thorax.

Heart.—Normal.

Pleura.—Normal.

Lungs.—The lungs were speckled with very numerous minute dark red foci of congestion. In the caudal lobes, under the pleura, there were diffuse pinkish areas of congestion, and the cephalic lobes contained several dark red collapsed lobules, the caudal lobes a few; with these exceptions the lungs were crepitant throughout.

Bronchial and Mediastinal Glands.—The bronchial and mediastinal glands were not obviously enlarged. On section their tissue was oedematous and congested.

Abdomen.

Omentum.—Normal.

Peritoneum.—Normal.

Spleen (140 grammes).—Normal.

Liver.—Normal.

Portal Glands.—Normal.

Kidneys.—Each kidney showed one or two grey points on the surface; these on section were prolonged into the cortex as fine radial streaks.

Suprarenal Bodies.—Normal.

Intestines.—Normal.

Other lymphatic glands (not mentioned above) were normal.

Microscopical Examinations.

(Smear preparations.)

Local Tumour.—Numerous slender tubercle bacilli.

Left Mid-cervical Gland.—Moderate number of tubercle bacilli.

Small Right Mid-cervical Gland.—Very numerous short tubercle bacilli, mostly single forms, but many large loose clumps seen.

Spleen.—A few small groups of tubercle bacilli, and a few scattered single forms (short diplobacilli stained blue ?).

Lungs.—Numerous short fat bacilli stained blue, also some longer slender forms; no tubercle bacilli.

Kidney.—Short blue stained bacilli in small number.

Liver.—No organisms.

Left Bronchial Gland.—No tubercle bacilli; a few organisms stained blue.

CALF 392. Virus P III.

Subcutaneous inoculation of culture derived from Calf 282 (inoculated with culture of original material) through G.P. 1612.

Dose—50·0 milligrammes.

Date—March 20, 1906.

Weight at Inoculation—52·16 kilos. [Age about 11 weeks.]

Killed when in good health—June 22, 1906. [94 days after inoculation.]

Clinical Notes.

Four days after the inoculation on the left side of the neck a slight local thickening could be felt the size of a two shilling piece.

On the 21st day a firm tumour had developed, measuring 7·5 by 9 cm. and not quite 2·5 cm. thick; the prescapular gland was enlarged, about 7·5 cm. in length.

Very little change took place subsequently in the local conditions; both tumour and gland diminished a little in size.

The calf remained well during the experiment.

Temperature.

There was a slight pyrexia and irregularity of temperature during the third and fourth weeks after inoculation, the maximum range of variation being between 38·2° and 39·4° C. Otherwise the temperature remained normal during the experiment.

Tuberculin Test.

May 31, 1906. [72 days after inoculation.] Reacted. Rise of temperature, 1·5° C.

Weights.

The animal gained weight rapidly during the experiment.

	Kilos.
March 20	52·16
April 24	87·98
May 15	96·14
June 21	111·65

Total gain of weight.—59·49 kilos.

Average rate of gain per week.—4·48 kilos.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—In the subcutaneous tissues on the left side of the neck there was a fluctuating tumour, measuring 7·5 by 5 by 4 cm.; on section this was found to be a cyst with thin fibrous walls and thick tenacious caseo-purulent contents; the cavity was lined internally by a thin layer of organised granulation tissue and was crossed by a number of slender fibrous trabeculae; the skin was lightly adherent to the capsule; in the muscles under the cyst there was a caseous mass the size of a broad bean with a capsule of fibrous tissue.

Left Prescapular Gland.—The left prescapular gland measured 5·3 by 2·8 by 1·2 cm. and showed in the cortex four calcareous nodules, one about the size of a kidney bean, the others much smaller; one of the nodules contained a small focus of caseo-pus.

Right Prescapular Gland.—The right prescapular gland measured 5·3 by 2·5 by 1·3 cm. and was normal on section.

Prepectoral and Cervical Glands on both sides were normal.

Thorax.

Lungs.—The lungs were perfectly normal in general appearance and no tubercles could be seen on the surface or on section.

Thoracic Glands.—The dorsal mediastinal glands and the left bronchial gland showed in the cortices a few minute yellow points one or two of which were just perceptibly gritty.

The right bronchial gland was normal.

Heart, Pericardium, and Pleura.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal

Spleen (252 grammes).—Normal

Liver.—Normal.

Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Alimentary Tract.

Tongue, Pharynx, and Tonsils.—Normal.

Intestines, Large and Small.—Normal.

Submaxillary, Pharyngeal, Parotid, Gastric, Mesenteric, Ileo-colic, and Colic Glands.—Normal.

Various Lymphatic Glands.

Renal, Lumbar, Iliac, Axillary, Precrural, Popliteal, Pudic, Gluteal, and Ischiatic Glands.—Normal.

Testes.—Normal

PIG 112. Virus P III.

Fed for seven days (from July 25 to July 29, 1905, and on July 31 and August 1) with culture derived from the original material; one serum tube used on each day.

Weight at commencement of experiment—14·06 kilos. [Age about 17 weeks.]

Killed when in good health—September 14, 1905. [51 days after the experiment began.]

Clinical Notes.

The pig remained in good health during the experiment.

Weights.

	Kilos.
July 25, 1905...	14·06
August 8, 1905	16·32
September 12, 1905	24·04

Total gain in weight during experiment.—9·98 kilos.

Average rate of gain per week.—1·35 kilos.

POST-MORTEM EXAMINATION.

Carcass in very good condition.

Alimentary Tract.

Tonsils.—Normal.

Tongue.—Normal.

Pharynx.—Normal.

Submaxillary Glands.—The left submaxillary glands were slightly enlarged and harder than those on the right side. Nothing abnormal was seen on section, but on crushing a small piece of one of the glands between ground glass plates a minute whitish point was observed.

Pharyngeal Glands.—Normal.

Cervical Glands.—Normal.

Stomach.—Normal.

Small Intestine.—The mucous membrane of the small intestine showed numerous shallow ulcers the margins of which in some cases had a whitish appearance; there was no appreciable thickening, however, of the margins or of the bases, and the peritoneal surface was normal. The ulcers were very numerous in the upper and middle parts of the intestine, and were punched out, circular or irregular in outline, ranging up to 2 or 3 millimetres in diameter; where they were most numerous they had become united.

In the lower part of the intestine the ulcers were not so numerous nor so definite in outline, and appeared as superficial erosions. They usually involved the mucous membrane only, but in one or two cases the peritoneum was seen to be exposed in the centre of the ulcer.

The Peyer's patches, except in the lower part, were severely affected, and in many the whole of the central part was eroded; in others there were irregular serpiginous ulcers, often surrounding isolated islands of mucous membrane. The ulcers extended to the muscle wall, the substance of the patch appearing as if eaten away in these places. There was no thickening of the margins of the ulcers nor of the bases, and there was no surrounding congestion. In the patches in the lower part of the intestine they became less pronounced, and in the long terminal patch one saw merely a number of small irregular pits.

Large Intestine.—The solitary lymphoid follicles were conspicuous, but not apparently enlarged; they had an opaque white appearance, and their central openings showed a little larger than usual; no ulcers were seen.

Mesenteric Glands.—All the mesenteric glands were firm, and were two or three times their normal in size. On the surface they showed a faint whitish mottling. On section they showed creamy white streaks or whitish foci throughout their substance; in some a kind of network was formed.

Ileo-colic Glands.—The ileo-colic glands were slightly enlarged, and contained a smaller number of streaks and foci.

Colic Glands.—The colic glands were normal.

Abdomen

Peritoneum.—Normal.

Liver.—In the substance of the liver, under the capsule, a pinhead-sized white spherical body was seen; otherwise normal.

Portal Glands.—Normal.

Spleen.—Normal.

Kidneys.—One kidney showed on the surface a grey point of doubtful nature. The other was normal.

Suprarenal Bodies.—Normal.

Thorax.

Lungs.—Normal.

Bronchial Glands.—Normal.

Mediastinal Glands.—Normal.

Heart.—Normal.

Pleura.—Normal.

Peripheral Lymphatic Glands.—Normal.

Testes.—Normal.

Microscopical Examinations.

(Smear preparations.)

Scraping from Mucous Membrane of Small Intestine.—Moderate number of tubercle bacilli.

Left Submaxillary Gland.—A few tubercle bacilli.

Mesenteric Gland.—Numerous tubercle bacilli.

Spleen ... ...
Liver ... ...
Kidney ... ... No tubercle bacilli.
Portal Gland ... ...
Lymphoid Follicle from Colon

CALF 318. Virus P III.

Subcutaneous inoculation of culture derived from the original material.

Dose—50·0 milligrammes.

Date—September 7, 1905.

Weight at Inoculation—97·90 kilos. [Age about 5½ months.]

Killed when in good health—December 11, 1905. [95 days after inoculation.]

Clinical Notes.

Five days after inoculation on the left side of the neck a flattened thickening could be felt, and the adjacent prescapular gland was slightly enlarged.

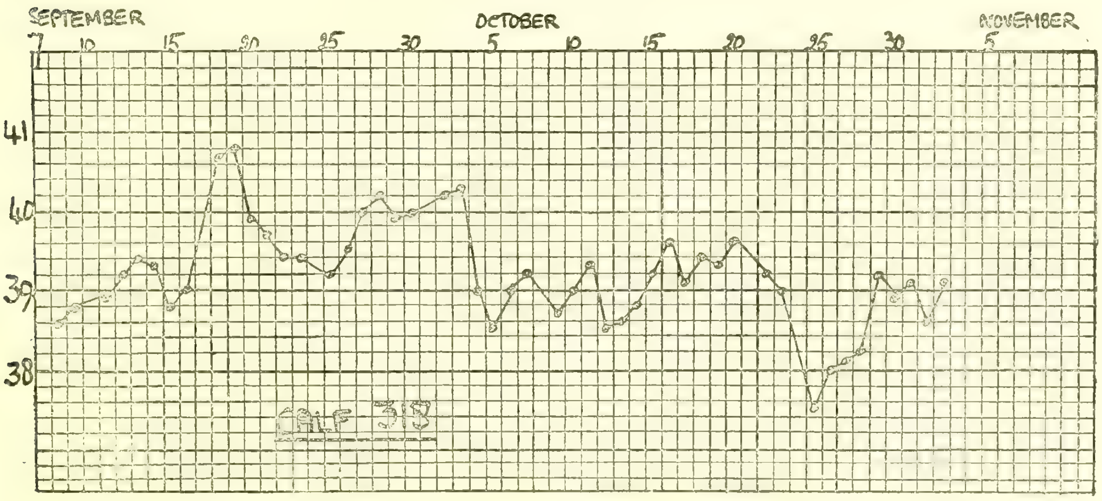
On the 15th day there was a slightly raised hard tumour measuring 14 by 10 cm.; the prescapular gland was very large, 12·5 cm. in length.

On the 23rd day both the tumour and the prescapular gland had shrunk a little. The calf which up to this time had been well, seem a little unwell and was quieter than usual.

On the 55th day the tumour measured 9 by 7·5 cm., it was adherent to skin and subjacent muscle and appeared to be softening. The prescapular gland was 11·5 cm. in length; the prepectoral gland was slightly enlarged. The general condition of the animal was now good. Subsequently one extremity of the left prescapular gland become soft and fluctuating. It increased in size and became adherent to the skin and finally (88th day) burst, discharging yellow pus; the opening then became covered with a scab. The calf was quite well.

No further change of importance took place in the local conditions.

Temperature. (Chart to November 2.)



From November 2 to December 11, when the calf was killed, the temperature remained normal.

Tuberculin Test.

November 17, 1905. [71 days after inoculation.] Slight reaction. Rise of temperature 0·7° C.

Weights.

	Kilos.
September 12	97·90
September 26	99·35
October 10	98·35
November 21	119·26
December 11	130·60

During the first four weeks the weight remained stationary ; afterwards the calf grew rapidly.

Total gain of weight during experiment—32·70 kilos.

Average rate of gain per week—2·26 kilos.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—At the seat of inoculation, on the left side of the neck, there was a tense fluctuating tumour, the shape of an egg, measuring 8·3 by 5 by 5 cm., and weighing with attached skin a little over 6 ozs. On section the tumour was a cyst containing yellowish pus (resembling muco-pus), and an irregular partially detached mass of dense yellowish white caseated tissue ; gritty particles were just perceptible in the firm caseous tissue as well as in the pus. The walls of the cyst were fibrous, moderately thick, and were lined internally with pale granulation tissue.

Left Prescapular Gland.—The left prescapular gland was much enlarged, and weighed 127 grammes. On section the greater part of the gland substance was composed of yellowish caseo-necrotic tissue, containing scattered minute gritty particles ; the necrotic tissue was for the most part firm, but was beginning to soften, and was in places converted into thick creamy white pus ; the whole mass was surrounded by a thick capsule of fibrous tissue. At the lower extremity of the gland there was a small portion of normal looking gland tissue containing two or three yellow tubercles.

The skin just in front of the left shoulder showed a raised scab, which, when removed, revealed an ulcer a little more than 1 cm. in diameter ; the floor of the ulcer presented exuberant granulation tissue, and showed in the centre the orifice of a sinus ; the latter extended into the prescapular gland, the capsule of which was pierced by a small opening towards the lower extremity. The sinus contained a little yellow pus, and was lined by a thick layer of brownish, somewhat translucent granulation tissue, which was surrounded by dense white fibrous tissue.

Right Prescapular Gland.—Normal.

Prepectoral Glands.—The rounded prepectoral gland on the left side measured 1 cm. in diameter, and was composed of dense necrosed tissue, softened around the periphery, and converted into thick yellow pus.
Right prepectoral gland normal.

Cervical Glands.—Normal.

Thorax.

Pleura.—Costal pleura normal. On the pleural surface of the diaphragm there was a loosely attached hæmorrhagic lenticular body about 8 millimetres in diameter.

Lungs.—In the left caudal lobe, under the pleura, there was a spherical yellow tubercle about 1 millimetre in diameter, and a greyish red nodule the size of a pea. Scattered about over the surface were minute dark grey points of a doubtful nature. On section the lungs were normal.

Bronchial Glands.—The right bronchial gland contained a soft yellow tubercle 1·5 millimetre in diameter, in which minute gritty particles could be detected.

Mediastinal Glands.—The caudal mediastinal gland contained two pinhead sized yellowish tubercles.

The gland above the bifurcation of the trachea contained a soft yellow tubercle 1·5 millimetre in diameter.

An infratracheal gland contained a similar tubercle, not perceptibly gritty.

Heart.—In the muscle substance of the left ventricle there was an irregular yellow gritty nodule about the size of a wheat grain, which easily shelled out ; otherwise the heart was normal.

Trachea.—Normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Small Intestine.—There were a few scattered soft yellow tubercles, some slightly gritty, in the Peyer's patches, and several firm projecting nodules up to the size of a pea. The latter were most numerous in the ileum, and the majority showed in the centre a small ulcer ; the nodules were firm, grey or greyish red, and homogeneous, except one, in which a yellow point was seen.

Large Intestine.—Normal.

Mesenteric Glands.—The mesenteric glands were not enlarged. They contained scattered opaque yellow softened tubercles, the largest about 1·5 millimetre in diameter ; they were rather numerous in the terminal gland.

Ileo-colic Glands.—The ileo-colic glands contained similar tubercles, grouped together in places to form nodules as large as a pea, of soft yellow, slightly gritty caseo-pus.

Spleen.—The spleen weighed 280 grammes, and was normal in size and general appearance.

Liver.—The liver was normal on the surface ; it showed on section a few scattered minute opaque yellow foci (fatty ?).

Gall Bladder.—Normal.

Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Renal Gland.—The renal gland contained two yellow pinhead-sized tubercles, one of which seemed gritty.

Coeliac Glands.—One contained two firm opaque yellow spherical tubercles, each about 1·5 millimetre in diameter ; another contained one similar tubercle, and a second the size of a pin's head.

Testes.—Normal.

Lymphatic Glands.

Right Gluteal Gland.—In the right gluteal gland there was a soft yellow tubercle, about 1·5 millimetre in diameter.

Submaxillary and Retro-pharyngeal. — The right submaxillary and the left retro-pharyngeal glands contained each a soft yellow miliary tubercle.
All other lymphatic glands were normal.

Tonsils.—Normal.

Pharynx.—Normal.

Larynx.—Normal.

Microscopical Examinations.

Prescapular Gland.—Moderately numerous tubercle bacilli.

Heart Nodule (two smears).—One tubercle bacillus seen in one.

Liver	No tubercle bacilli.
Intestinal Nodule ...	
Dorsal Mediastinal Gland	A few tubercle bacilli.
Renal Gland	
Coeliac Gland	No tubercle bacilli.
Submaxillary Gland ...	

CALF 530. Virus P III.

Subcutaneous inoculation with culture derived from Calf 318.

Dose—5,000·0 milligrammes.

Date of Inoculation—April 25, 1907. [Age 12 weeks.]

Killed when in good health—October 10, 1907. [168 days after inoculation.]

Clinical History.

The animal showed no sign of ill-health.

Temperature.

The temperature remained normal throughout.

Tuberculin Test.

September 18, 1907. [146 days after the experiment began.] Dose of tuberculin (Bovine), 2·0 cc. No reaction.

Weights.

	Kilos.
April 25, 1907	28·12
October 10, 1907	79·81

Total gain in weight.—51·69 kilos.

POST-MORTEM EXAMINATION.

Condition good.

Local Lesion.—At the seat of inoculation in the subcutaneous tissue on the left side of the neck there were six nodules varying in size from a pea up to a sparrow's egg. On section they were filled with a creamy yellow caseo-purulent substance.

Left Prescapular Gland.—Normal.

There was no sign of disease elsewhere in the body. A culture grown from the local lesion was avian in character.

RHESUS MONKEY 134. Virus P III.

Subcutaneous inoculation of culture derived from the original material.

Dose—10·0 milligrammes.

Date of Inoculation—April 12, 1906.

Killed—August 21, 1906. [131 days later.]

Clinical Notes.

Twenty-two days after inoculation there was a well-defined raised tumour at the seat of inoculation, soft and fluctuating, and measuring 4 by 2·5 cm. by about 1 cm.; the skin over the centre showed a small opening discharging sero-pus (the opening appeared on the 20th day). An axillary gland on the right side seemed enlarged.

On the 43rd day the tumour measured 4 by 2·5 cm., with a small dry ulcer about the middle showing a minute opening discharging yellowish pus. The axillary glands were normal in size.

On the 70th day the tumour was represented by a small irregular thickening with a minute ulcer in the overlying skin.

The monkey remained well during the experiment.

Temperature.

Approximately normal throughout.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—The only sign of a local lesion was a small white cicatrix in the mid-line of the skin of the back.

Axillary and Inguinal Glands.—Normal.

Thorax.

Pleura, Lungs, Thoracic Glands, Heart.—Normal.

Abdomen.

Peritoneum, Liver, Spleen, Kidneys.—Normal.

Alimentary Tract.

Tongue, Pharynx, Palate; Submaxillary and Pharyngeal Glands.—Normal.

Intestines.—On the peritoneal surface of the caecum there was a nodule the size of a sparrow's egg; it was adherent to the caecum, colon, and abdominal wall. On dissecting it away from the colon a little pus escaped, together with a worm (the pus contained numerous tubercle bacilli).

On section the nodule consisted of translucent fibrous walls containing an irregular cavity filled with caseo-pus; the wall also was infiltrated with irregular caseo-purulent collections. In the caecum there was a minute ulcer on the mucous surface with rounded smooth edges, which communicated with the largest cavity in the nodule.

There was a second nodule close by which had no definite communication with the caecum; its wall was thinner and lined by pinkish grey tissue, and it was filled with caseo-pus (tubercle bacilli found in moderate numbers).

Mesenteric Glands.—Normal.

Various Lymphatic Glands.

Prescapular, Cervical, Lumbar, Iliac.—Normal.

Microscopical Examinations.

(Smear preparations.)

Pus from First Nodule in Caecum.—Numerous tubercle bacilli.

Pus from Second Nodule in Caecum.—Moderately numerous tubercle bacilli.

DOG 122 (Puppy). Virus P III.

Subcutaneous inoculation of culture derived from the original material.

Dose—25·0 milligrammes.

Date of Inoculation—April 12, 1906.

Killed—June 25, 1906. [74 days after inoculation.]

Clinical Notes.

The animal gradually became thin and emaciated and lost power in its hind legs, both of which were contracted up against its abdomen.

POST-MORTEM EXAMINATION.

The examination revealed nothing to account for the above-mentioned contractures; they were probably due to a rheumatic affection, the result of living on a concrete floor.

The body was thin.

Local Lesion.—In the subcutaneous tissues to the left of the umbilicus there was an elongated flat space, filled with clear watery fluid, surrounded by a thin wall of fibrous tissue lined with pale granulation tissue; the space communicated externally through a minute puncture in the skin.

Left Inguinal and Iliac Glands.—The left inguinal and iliac glands were slightly enlarged but not otherwise abnormal.

Thorax.

Lungs.—The left caudal lobe showed on the surface under the pleura two tubercles; one the size of a millet-seed grey and translucent, the other that of a pin's head with an opaque white centre. The rest of the lungs was normal.

Bronchial Glands, Heart, and Pleura.—Normal.

Abdomen.

Peritoneum.—Normal.

Spleen.—Normal.

Liver.—The liver contained scattered grey points throughout the substance.

Kidneys.—The kidneys were pale and tough, but showed no tubercles.

The neck and peripheral glands were normal.

All other glands and organs were normal.

Microscopical Examinations.

Smear from Lung.—A few tubercle bacilli were seen.

Smear from Liver—A moderate number of tubercle bacilli was seen.

Pony 14 (Yearling). Virus P III.

Feeding with culture derived from the original material.

Dose—600·0 milligrammes. [100 milligrammes given daily for six days in its drinking water.]

Date of First Feed—January 29, 1908. [Age about 1 year.]

Killed when in good health—June 15, 1908. [138 days after first feed.]

Clinical History.

There was no sign of ill-health during the experiment.

Temperature.

Normal.

Tuberculin Tests.

March 13, 1908. [44 days after the experiment began.] No reaction.

May 13, 1908. [105 days after the experiment began.] Rise of temperature 1·3 C.

Weights.

	Kilos.
January 29, 1908	118·79
June 15, 1908	131·49

Total gain in weight.—12·70 kilos.

POST-MORTEM EXAMINATION.

General condition good.

Tonsils.—In the right tonsil there was a small collection of irregular caseous gritty foci.

Submaxillary Glands.—Normal.

Cervical Glands.—In each of these left superior cervical glands there was a single yellowish focus one of which was gritty. Each of two right superior cervical glands contained collections of caseous gritty tubercles and patches, a third contained two or three opaque foci.

Intestines.—Normal.

Mesenteric Glands.—The majority of the mesenteric glands were normal. Nine of them contained a varying number, usually a few, discrete caseous gritty nodules up to a wheat grain. The nodules were opaque yellow with translucent margins, some of which separated quite easily from the surrounding gland substance.

Colic Glands.—The numerous small colic glands, with very few exceptions, contained firm yellowish white caseous slightly gritty nodules up to a pea in size.

Abdomen.

Omentum.—In the omentum there was a number of irregular small yellow calcareous streaks and nodules.

Spleen.—311 grammes normal.

Liver.—On the capsule of the liver there were a few translucent foci. Beneath the capsule and in the substance there was a moderate number or translucent tubercles varying up to about a millet seed in size; many of them showed minute central opacities.

Kidneys.—Normal.

Thorax.

Lungs.—The lungs were soft and crepitant. Beneath the pleura of the left lung there were a few scattered translucent tubercles varying up to a millet seed and a single yellow caseo-calcareous nodule the size of a hemp seed. On section through the substance an occasional translucent tubercle was seen. Beneath the pleura of the right lung there were a few translucent tubercles and a yellow waxy nodule with a more opaque sharply defined streak in the centre.

Thoracic Glands.—In the bronchial and mediastinal glands there were just visible a few minute opaque foci.

Heart, Diaphragm, Larynx, Pharynx, and Pleura.—Normal.

Other Lymphatic Glands.—Normal.

In the muscle on the left side of the neck there was a fibrous thickening containing some caseous gritty foci. (Tuberculin had been inoculated in this region.)

Microscopical Examinations.
(Smear Preparations.)

Tonsil.—A moderate number of tubercle bacilli.

Right Cervical Gland.—A moderate number of tubercle bacilli.

Left Cervical Gland.—A moderate number of tubercle bacilli.

Mesenteric Gland.—A moderate number of tubercle bacilli.

Omentum.—A few tubercle bacilli.

Nodule from Neck.—A few tubercle bacilli.

Liver.—No tubercle bacilli.

Bronchial Gland.—No tubercle bacilli.

GOAT 58. Virus P III.

Intravenous injection with culture from the original material.

Dose—1·0 milligramme.

Date of Inoculation—January 29, 1908.

Age—8 months.

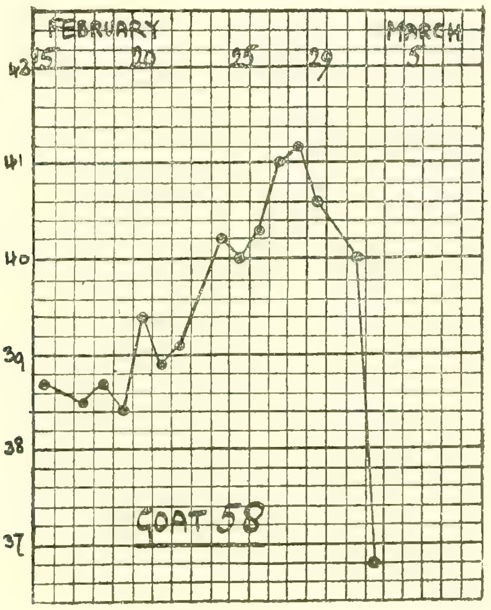
Died—March 4, 1908. [35 days after inoculation.]

Clinical History.

The animal rapidly became ill and thin and breathed quickly.

Temperature.

The temperature remained normal until February 18, 1908. The remaining temperatures are given in the chart below.



Weights.

	Kilos
January 29, 1908	22·22
March 4, 1908	15·87

Total loss in weight.—6·35 kilos.

POST-MORTEM EXAMINATION.

Carcass emaciated.

Thorax.

Lungs.—The lungs were firm, heavy, and were dark reddish grey in colour. The anterior lobes and the inferior portions of the posterior were solid and sank in water. On section they were filled with blood and oedema, but there was no sign of caseation.

Bronchial and Mediastinal Glands.—Normal.

Heart.—Normal.

Abdomen.

Mesenteric Glands and Intestines.—Normal.

Spleen.—Normal.

Liver.—On the surface of the liver and sparsely distributed throughout the substance were translucent nodules up to the area of a millet seed. They were both rounded and oval in shape, and the centres were opaque yellowish and gritty (no tubercle bacilli). Liver substance was otherwise normal.

Portal Glands.—Normal.

Kidneys.—In the pyramids and the cortices of the kidneys were numerous fine whitish streaks (urates).

Suprarenal Bodies.—Normal.

Tongue, Tonsils, Larynx and Pharynx.—Normal.

Various Lymphatic Glands.

Parotid, Submaxillary, Cervical, Prescapular, Pre-

crural, Axillary, Renal, Coeliac, Lumbar, Iliac, and Popliteal Glands.—Normal.

Microscopical Examinations.

(Smear preparations.)

Lung (substance).—Moderately numerous tubercle bacilli.

Liver (substance).—Moderately numerous tubercle bacilli.

Liver (nodule).—No tubercle bacilli.

Spleen (substance).—A few tubercle bacilli.

Kidney (substance).—No tubercle bacilli.

Mediastinal Gland (substance).—Numerous tubercle bacilli.

GOAT 56. Virus P III.

Intravenous injection with culture derived from the original material.

Dose—10·0 milligrammes.

Date of Inoculation—January 29, 1908.

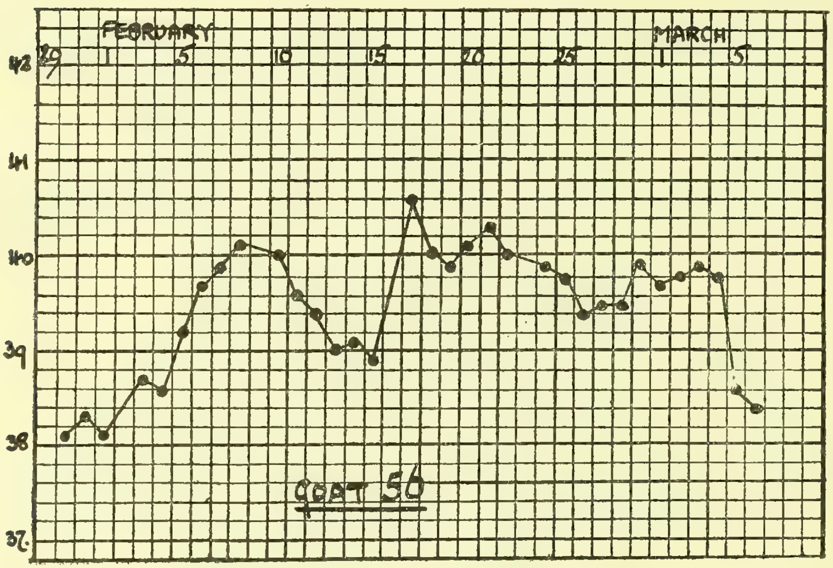
Age—Young adult.

Died—March 9, 1908. [40 days after inoculation.]

Clinical History.

The animal lost flesh and breathed rapidly ; respiration was very laboured before death.

Temperature.



Weights.

	Kilos.
January 29, 1908	12·70
March 9, 1908	8·16

Loss in weight.—4·54 kilos.

POST-MORTEM EXAMINATION.

Carcass emaciated.

Thorax.

Lungs.—The lungs did not collapse normally ; they were heavy, but floated in water. The parenchyma was congested and oedematous.

Bronchial Glands.—Normal.

Mediastinal Glands.—Normal.

Heart.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Intestines.—Normal.

Mesenteric Glands.—Normal.

Spleen, Liver, Portal Glands, Kidneys, and Suprarenal Bodies.—Normal.

Lymphatic Glands.—Submaxillary, Cervical, Prescapular, Axillary, Renal, Lumbar, Coeliac, Iliac, Precrural and Popliteal Glands.—Normal.

Microscopical Examinations.

(Smear preparations.)

Lung.—Numerous tubercle bacilli.

Spleen.—Three tubercle bacilli.

Liver.—Moderately numerous tubercle bacilli.

Kidney.—A few tubercle bacilli.

Mesenteric Gland.—Very numerous tubercle bacilli.

Intestine (scraping).—Moderately numerous tubercle bacilli.

VIRUS P XXI. (Submaxillary Gland of a Pig).

CULTURE INOCULATIONS.

I.—February 19, 1906.

The strain was derived from the original material and had been in cultivation a total period of 77 days.

The culture used was the 4th generation, 21 days old.

FOWLS.

Number.	Method.	Dose.	Duration of Life.	Result.
26	Fed	10·0 mg.	K. 92 days	G.T.
28	Fed	10·0 mg.	D. 103 ,,	G.T.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
1912	Intrap.	1·0 mg.	D. 30 days	Acute avian T.
1911	Subcut.	1·0 mg.	K. 116 ,,	Healed ulcer only.

RABBIT 774.

Intraperitoneal.
Dose : 1·0 mg.
Died : 29 days.
P.M.—Acute tuberculosis.

II.—April 12, 1906.

The strain was derived from the original material, and had been in cultivation a total period of 129 days.

The culture used was the fifth generation, 19 days old.

DOG 124 (Puppy).

Subcutaneous.
Dose : 25·0 mg.
Died : May 15th, 1906.
33 days.

P.M.—Small local lesion of granulation tissue. Patches of broncho-pneumonia (no T.B.) in the lungs. Bronchial glands appeared normal but contained numerous T.B. No disease elsewhere.

MONKEY 136.

Subcutaneous.
Dose : 10·0 mg.
Killed : August 28th, 1906.
138 days.

P.M.—At the seat of inoculation there was a fibrous walled tumour containing muco-purulent nodules. Adjacent glands were normal.

VIRUS P XXI. (Submaxillary Gland of a Pig)—*continued.*

CULTURE INOCULATIONS—*continued.*

III.—May 22, 1906.

The strain was derived from the original material, and had been in cultivation a total period of 169 days.

The culture used was the 8th generation, 21 days old.

CALF 412.

Subcutaneous.

Dose : 50·0 mg.

Killed : August 29, 1906.

99 days.

P.M.—Fibroid local tumour, with muco-pus in a central cavity. The right prescapular gland was largely caseo-necrotic and softened. In the lungs there were three hard caseo-calcareous nodules. One tubercle was seen in the right tonsil, and four or five in each suprarenal ; a few gritty foci were seen in the spleen, and minute grey foci in the liver. Nearly every lymph gland in the body and many haemo-lymph glands contained scattered calcareous foci or a few small caseous or calcareous tubercles.

GUINEA-PIGS.

Material.	Number.	Method.	Duration of Life.	Result
E. of lung	2161	Intrap.	K. 64 days	No T.
	2162	Intrap.	K. 57 „	No T.
E. of mesenteric gland.	2163	Intrap.	K. 64 „	No T.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
879	Intrav.	0·01 mg.	D. 30 days	G. T.
880	Intrav.	0·001 mg.	K. 140 „	Chronic G. T.
881	Intrav.	0·0001 mg.	K. 139 „ (ill).	Chronic G. T.
876	Subcut.	50·0 mg.	D. 163 „	Chronic G. T.
877	Subcut.	10·0 mg.	D. 92 „	Slight G. T.
878	Subcut.	1·0 mg.	D. 155 „	G. T.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2034	Subcut.	10·0 mg.	D. 28 days	S. T.
2033	Subcut.	1·0 mg.	D. 28 „	S. T.

VIRUS P XXI. (Submaxillary Gland of a Pig)—*continued.*

CULTURE INOCULATIONS—*continued.*

IV.—NOVEMBER 22, 1906.

The strain was derived from the original material, and had been in cultivation a total period of 383 days.

The culture used was the 11th generation, 22 days old.

RATS.

Number.	Method.	Dose.	Duration of Life.	Result.
105	Intrap.	1·0 mg.	K. 109 days	Local T. T.B. in organs.
107	Subcut.	10·0 mg.	K. 109 ,,	Scar only.
106	Subcut.	1·0 mg.	K. 109 ,,	Minute hole in skin only.

MONKEY 154.

Intravenous.

Dose : 1·0 mg.

Died : December 26, 1906

34 days.

P.M.—The right lung was congested, and in it could be seen numerous grey foci. The left lung was paler, and only a few foci were seen in it. The spleen was enlarged and abnormal in appearance; no definite tubercles were seen. In the kidneys an occasional grey point could be seen. A few tubercle bacilli were seen in scrapings from the spleen, liver, and lung; none in the kidney, or in several lymphatic glands which were examined microscopically.

MONKEY 156.

Fed (on three occasions).

Doses : 50·0, 100·0, and 100·0 mg.

Killed : April 22, 1907.

151 days.

P. M. — Normal throughout.

FOWLS.

Number.	Method.	Dose.	Duration of Life.	Result.
152	Intrav.	1·0 mg.	K. (ill) 42 days	G. T.
150	Intrap.	1·0 mg.	D. 75 days	G. T.
148	Subcut.	10·0 mg.	D. 71 ,,	G. T.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1092	Fed	20·0 mg.	D. 195 days	Slight G. T.
1091	Fed	10·0 mg.	D. 86 ,,	No T.

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2220	Fed	10·0 mg.	D. 99 days	No T.
2221	Fed	10·0 mg.	K. 102 ,,	No T.

DOG 124 (Puppy). Virus P XXI.

Subcutaneous inoculation of culture derived from the original material.

Dose—25·0 milligrammes.

Date of Inoculation—April 12, 1906.

Died—May 15, 1906. [33 days after inoculation.]

POST-MORTEM EXAMINATION.

Local Lesion.—In the subcutaneous tissues in the middle line of the abdomen there was a thickening about the area of a shilling ; on section this was composed of grey granulation tissue infiltrated with soft yellow streaks.

Axillary and Inguinal Glands. — These glands appeared normal.

Thorax.

Lungs.—On examination of the lungs lying in the chest cavity it was noticeable that the inferior margins were dark and firm ; more than half the cephalic lobes and the whole of the middle lobe were grey, solid, and sank in water. The anterior portions of the caudal lobes contained patches of this dark grey tissue, and scattered throughout the rest of the substance also were similar small dark areas. On section these solid areas were markedly oedematous, the fluid sometimes being purulent. Just beneath the pleura there were three soft yellow foci up to a pinhead in size.

Bronchial Glands.—The bronchial glands seemed a little enlarged.

The Spleen, Liver, Kidneys, and other organs and glands appeared normal.

Microscopical Examinations.

(Smears from)

Bronchial Gland.—Tubercle bacilli fairly numerous.

Solid grey Lung ...	No tubercle bacilli seen.
Purulent focus from Lung (1).	
Purulent focus from Lung (2).	
Kidney	
Spleen	
Liver	

Animal Inoculated.

Guinea-pig 2028 was inoculated with an emulsion of lung, and died in two days of acute peritonitis.

RHESUS MONKEY 136. Virus P XXI.

Subcutaneous inoculation of culture derived from the original material.

Dose—10·0 milligrammes.

Date of Inoculation—April 12, 1906.

Killed—August 28. [138 days later.]

Clinical Notes.

A soft fluctuating tumour developed at the seat of inoculation between the shoulders. On the 20th day an opening appeared through which thick yellow pus was discharged ; the tumour then measured 5 by 4 by about 1·2 cm. The axillary glands were (?) slightly enlarged.

On June 26, 75 days after inoculation, the local tumour consisted of a flat thickening 3·8 by 2·5 cm., the skin over which showed a small opening discharging turbid serous fluid containing yellow flakes. The axillary glands were not enlarged.

On August 28 the monkey was killed when in good health.

Temperature.

The temperature remained practically normal, the maximum range of variation being between 37·9° C. and 39·6° C.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—In the skin of the back, at the level of the tenth dorsal vertebra to the left of the mid line, there was a small ulcer (2 mm. in diameter) with clean thin edges. This communicated with a cavity in the subcutaneous tissues measuring about 2·5 by 3·8 cm. The cavity was enclosed in a thin fibrous wall adherent to the skin but not to the muscle ; it was lined by granulation tissue in which were contained small yellowish white nodules which consisted of collections of muco-pus.

Axillary and Inguinal Glands.—Normal.

Thorax.

Pleura, Lungs, Thoracic Glands, Heart.—Normal.

Abdomen.

Peritoneum, Liver, Portal Gland, Spleen, Kidneys.—Normal.

Alimentary Tract.

Tongue, Pharynx, Palate ; Pharyngeal and Submaxillary Glands ; Intestines and Mesenteric Glands.—Normal.

Various Lymphatic Glands.

Prescapular, Cervical, Lumbar, Iliac.—Normal.

Microscopical Examination.

(Smear Preparation.)

Local Lesion.—Tubercle bacilli scanty (eight seen).

CALF 412. Virus P XXI.

Subcutaneous inoculation of culture derived from the original material.

Dose—50·0 milligrammes.

Date of Inoculation—May 22, 1906.

Weight at Inoculation—27·66 kilos. [Age about 5 weeks.]

Killed when in good health—August 29, 1906. [99 days after inoculation.]

Clinical Notes.

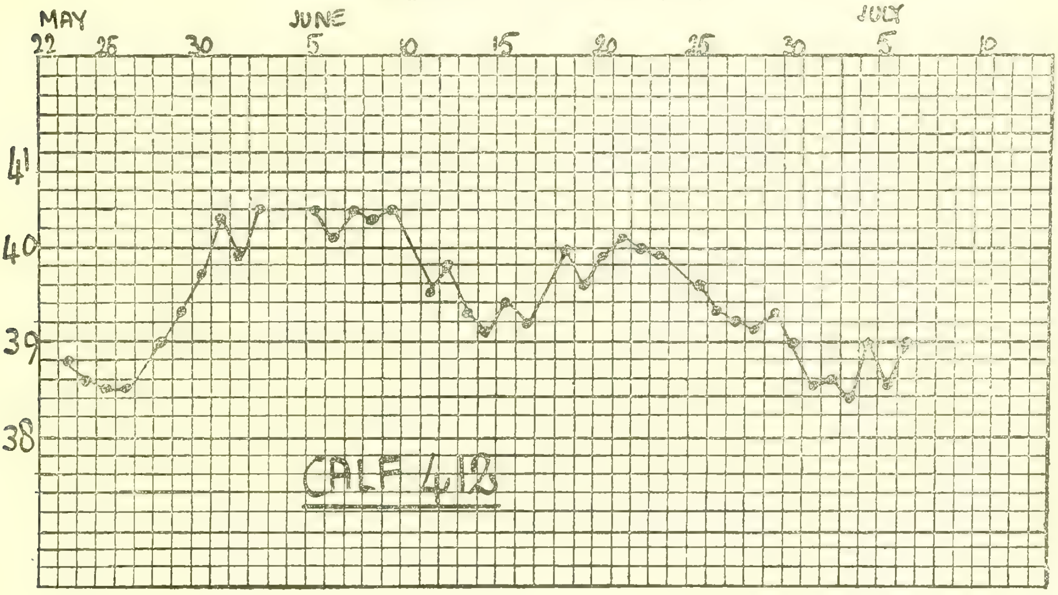
Eighteen days after inoculation on the right side of the neck there was a firm tumour measuring 6·3 by 5 cm. by about 2 cm. in greatest thickness; the adjacent prescapular gland was enlarged, 6·3 cm. in length.

On the 35th day the tumour was firm and prominent, measuring 8·3 by 6·3 cm.; the prescapular gland was considerably enlarged, 10 cm. in length; the prepectoral gland was the size of a marble.

Both tumour and glands subsequently diminished little in size.

The calf remained well during the experiment.

Temperature. (Chart to July 7.)



From July 7 to August 29 the temperature remained normal.

Weights.

	Kilos.
May 22	27·66
July 17	38·55
August 29	45·80

Total gain of weight.—18·14 kilos.

Rate of gain per week.—1·26 kilos.

POST-MORTEM EXAMINATION.

Carcass in fair condition.

Local Lesion.—On the right side of the neck there was a lenticular tumour measuring 7 by 5 by 2·5 cm. In the skin, almost in the centre of the tumour, there was a funnel-shaped depression filled in by a dried scab terminating in a small ulcer, from which caseo-purulent substance could be expressed. The outer part of the tumour had coalesced with the skin, forming a firm fibrous wall 1·3 cm. in thickness in which were embedded numerous softened caseous and slightly gritty foci. In the centre there was a cavity containing thick muco-pus and lined by pinkish grey granulation tissue which was fairly closely beset with gritty caseous streaks and patches.

Right Prescapular Gland.—The right prescapular gland weighed 170 grammes and measured 8·3 by 7 by 5 cm. On section the gland was largely composed of caseo-necrotic substance with an irregular cavity surrounding a central necrotic mass not completely detached. The cavity was distended with turbid serum and the walls were ragged. Around the periphery of the tumour there were parts of the gland tissue remaining, in which were embedded discrete yellow caseous foci.

Left Prescapular Gland.—The left prescapular gland showed two yellow foci not appreciably gritty.

Prepectoral Glands.—The right rounded prepectoral gland was 2 cm. in diameter, and consisted of a translucent matrix closely beset with gritty caseous streaks. The whole could be shelled out of its capsule.

The right reniform prepectoral contained one caseo-calcareous nodule the size of a small pea, and scattered yellow caseous foci.

The left round prepectoral contained one minute yellow caseous focus.

The left reniform prepectoral showed three similar foci, one slightly gritty.

Axillary Glands.—The left axillary glands showed a few caseous foci.

Right axillary normal.

Cervical Glands.—The cervical glands showed a few opaque caseous foci.

Thorax.

Pleura.—Normal.

Lungs.—The surfaces of the lungs were peppered with minute foci of congestion, and from the surface of the posterior lobe of right lung a minute calcareous grain was picked out.

At the apex of the right cephalic lobe there were two hard caseo-calcareous nodules, the larger 1 cm. by 1·5 mm. Close by at the extreme margin there was a hard triangular nodule 1·3 by 6 cm. between the two pleural surfaces.

Thoracic Glands.—The bronchial glands on both sides contained moderately numerous calcareous grains easily picked out, the largest the size of rape seed.

The long mediastinal gland had the cortex fairly closely filled with similar slightly irregular tubercles.

The other mediastinal glands showed similar scattered foci.

Heart and Pericardium.—Normal.

Abdomen.

Peritoneum.—Normal.

Spleen.—The spleen was not enlarged, and in the substance there were sparsely scattered minute gritty foci (7 counted).

Liver.—In the liver there were minute grey foci, sparsely scattered in places, and moderately numerous in others.

Portal Glands.—The portal glands showed a moderate number of irregular calcareous foci.

Gall Bladder.—Normal.

Intestines.—In the first few feet of the small intestine there were numerous nodules about 15 to the inch, up to a wheat grain in size. They were apparent from both sides, but raised and palpable internally where they were covered by the mucous membrane. On section they consisted of soft creamy substance which shelled out, leaving no trace behind. They occurred almost entirely in Peyer's patches. The Peyer's patches were atrophied irregularly, sometimes the only remaining part being along the margins and around these yellow nodules.

Towards the distal part of the small intestine the nodules diminished in number, being confined entirely to Peyer's patches.

They were present in small numbers in the large intestine.

Gastric Glands.—The gastric glands contain yellow gritty foci the size of rape seed.

Mesenteric Glands. — The mesenteric glands all showed irregular yellowish tubercles up to nearly a millet seed in size. Some were soft, caseous, and slightly gritty, others were calcareous grains. In the anterior glands they were the most numerous, becoming only scattered posteriorly.

Colic Glands.—The colic glands were similar to the gastric glands.

Kidneys.—The kidneys were normal.

Suprarenals.—In each suprarenal there were 3 to 5 yellowish pinhead-sized tubercles, some gritty and some soft.

Renal Glands.—In the cortices of each renal gland there was a moderate number of discrete - gritty caseous tubercles up to 1·5 mm.

Coeliac Glands.—The coeliac glands contained in the cortices scattered caseous foci varying up to a rape seed, some soft, others gritty.

Lumbar and Iliac Glands.—The lumbar glands showed a few similar tubercles. The iliac glands showed moderately numerous caseo-calcareous tubercles, 25 in one gland.

Testes.—Normal.

Tonsils.—The right tonsil showed one soft yellow tubercle.

Tongue, Larynx, and Pharynx.—Normal.

Various Lymphatic Glands.

The Submaxillary Glands on both sides showed a few caseo-calcareous tubercles the size of rape seed.

Parotid Glands.—Each showed two similar tubercles.

Pharyngeal Glands. — Each showed discrete soft yellow tubercles, some slightly gritty.

Popliteal Glands.—Normal.

Gluteal Glands. — The left contained one yellow tubercle. The right contained a few up to a pinhead in size.

Ischiatic Glands.—A few minute opaque foci were seen in the right; the left was normal.

Pudic Glands.—Each showed a few minute yellow foci. The right contained also a soft yellow pinhead-sized tubercle.

Haemolymph Glands.—Many of the haemolymph glands contained calcareous tubercles.

Microscopical Examinations.

(Smear preparations.)

Focus from Spleen.—Three tubercle bacilli seen.

Tubercle from Suprarenal.—Tubercle bacilli numerous.

RHESUS MONKEY 154. Virus P XXI.

Intravenous inoculation (into vein at the bend of the right elbow) of culture derived from the original material.

Dose—1·0 milligramme.

Date of Inoculation—November 22, 1906.

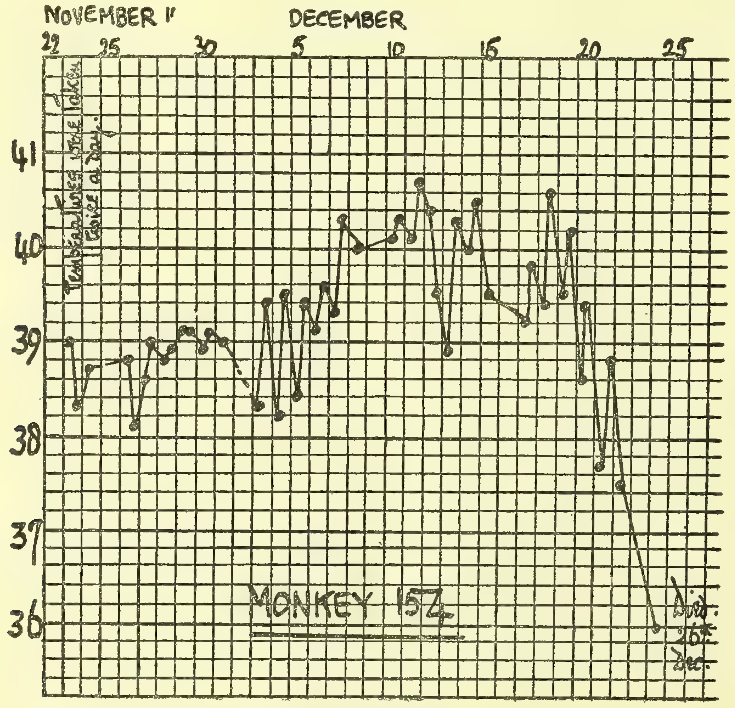
Died—December 26, 1906. [34 days later.]

Clinical Notes.

Sixteen days after the inoculation the wound had healed, and the animal seemed in good health. On the twentieth day he was not so well; his expression was anxious, and the eyelids were oedematous.

On the twenty-eighth day his coat was rough and he was obviously ill, and on the thirty-fourth day was dead.

Temperature.



Tuberculin Test.

The monkey was not tested subsequent to inoculation.

POST-MORTEM EXAMINATION.

The carcass was thin, but not emaciated.

Thorax.

Lungs.—The right lung was dark and congested, and in it could be seen numerous grey foci. The left lung was paler, and only a few foci could be seen in it.

Bronchial Glands.—The bronchial glands appeared enlarged.

Heart and Pleura.—Normal.

Abdomen.

Spleen.—The spleen was enlarged, measuring 8·3 by 3·8 by 3·2 cm. The greater part of the convex surface had a grey necrotic appearance; on section the malpighian bodies stood out, surrounded by a greyish white network.

Liver.—The liver appeared normal.

Kidneys.—In the medulla of each kidney an occasional grey point could be seen.

Lumbar and Iliac Glands.—These glands were perhaps a little enlarged.

Alimentary Tract.

Tongue, Pharynx, Palate, Submaxillary Glands.—Normal.

Intestines and Mesenteric Glands.—Normal.

Various Lymphatic Glands.

Right Axillary.—This gland contained a grey purulent nodule.

Left Axillary, Cervical, Prescapular, Inguinal.—Normal.

Microscopical Examinations.

(Smear preparations.)

Spleen.—A few tubercle seen.

Liver.—Three tubercle bacilli seen.

Lung.—Two tubercle bacilli seen.

Kidney.—No tubercle bacilli seen.

Bronchial Gland.—No tubercle bacilli seen.

Inguinal Gland.—No tubercle bacilli seen.

Axillary Gland.—No tubercle bacilli seen.

RHESUS MONKEY 156. Virus P XXI.

Fed on three occasions with culture derived from the original material.

Doses
50·0 milligrammes on November 22, 1906.
100·0 milligrammes on December 5, 1906 (13 days later).
100·0 milligrammes on January 8, 1907 (47 days later).

Killed—April 22, 1907. [151 days after commencement of experiment.]

Clinical Notes.

The animal showed no signs of ill-health during the experiment.

Temperature.

From the day of inoculation to February 9, the temperature remained approximately normal. No record of the temperature was kept after the latter date.

Tuberculin Test.

February 8, 1907. [78 days after commencement of experiment.] No reaction. Rise of temperature, 0·2° C.

POST-MORTEM EXAMINATION.

The carcass was in good condition, with a fair amount of subcutaneous fat.

Alimentary Tract.

Tongue, Pharynx, Tonsils, Submaxillary Glands.—Normal.

Intestines, Mesenteric Glands.—Normal.

Thorax.

Pleura, Lungs, Bronchial Glands, Heart.—Normal.

Abdomen.

Peritoneum, Liver, Spleen, Kidneys.—Normal.

Various Lymphatic Glands.

Prescapular, Axillary, Cervical, Inguinal.—Normal.

CALF 390. Virus P XXVII.

Subcutaneous inoculation of culture derived from the original material.

Dose—50·0 milligrammes.

Date of Inoculation—February 22, 1906. [Age about 15 weeks.]

Killed when in good health—May 23, 1906. [90 days after inoculation.]

Temperature.

The temperature remained approximately normal throughout.

Tuberculin Test.

The calf was not tested subsequent to inoculation.

Weights.

	Kilos.
February 22, 1906	63·50
May 23, 1906	89·79

Total gain of weight.—26·30 kilos.

POST-MORTEM EXAMINATION.

Condition good.

Local Lesion.—At the seat of inoculation there was a firm elongated thickening, measuring 16·5 cm. in length, 6·5 cm. in breadth, and about 2·5 cm. in greatest thickness. The skin in the upper part showed a depressed scar, in the centre of which there was some dried discharge ; under the latter there was a small collection of caseo-pus. On section the local lesion was composed of two layers ; one of thickened skin, the other of pinkish fibrous tissue, each layer being about half an inch thick ; scattered about in both layers were soft caseous tubercles, some perceptibly gritty, with translucent fibrous capsules.

The skin over the lower part of the left prescapular gland showed the orifice of a sinus surrounded by a bunch of granulations ; this sinus communicated with the interior of the prescapular gland and was lined with granulation tissue and surrounded by a thick wall of fibrous tissue.

Left Prescapular Gland.—The left prescapular gland measured 6 by 6 by 5 cm. ; on section it was composed of a thick fibrous capsule, lined internally with a thin layer of pale smooth granulation tissue, and an irregular mass of pinkish slightly gritty caseated tissue which was almost completely separated from the capsule by thick caseo-pus.

Right Prescapular Gland.—Normal.

Prepectoral Glands.—On the left side the spherical gland was the size of a Barcelona nut and showed in the centre a firm mass which was completely separated from a thickened capsule by caseo-pus ; the mass on section was composed of a marginal zone of dense gritty caseated material surrounding a central core of reddish fibroid tissue. Other glands on this side and all those on the left were normal.

Cervical Glands.—Normal.

Thorax.

Heart and Pleura.—Normal.

Lungs.—On the dorsal surface of the left cephalic lobe under the pleura there was a slightly raised firm nodule, the size of a kidney bean ; this consisted of reddish tissue with an irregular slightly gritty caseous patch in the centre. In each lung two or three small grey tubercles, the largest the size of a pin's head, were seen.

Thoracic Glands.—The left bronchial gland, not apparently enlarged, contained scattered calcareous nodules ranging from 1 to 5 mm. in diameter.

The right bronchial gland contained discrete yellow calcareous tubercles.

The long dorsal mediastinal glands, normal in size, contained calcareous tubercles with fibrous margins, mostly discrete, but in two places aggregated together.

Two glands in front of the latter contained a few calcareous caseous nodules.

An intratracheal gland resembled the left bronchial gland. The ventral mediastinal glands were normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Spleen (280 grammes).—Normal on the surface and on section.

Liver.—The capsule of the liver showed numerous greyish white spots, the largest 1 mm. in diameter ; these did not extend into the liver substance and appeared to be merely slight thickenings of the capsule.

The substance of the liver contained scattered grey tubercles, ranging in size from a mere point up to 1 mm. in diameter ; the majority of these had opaque centres which in the larger ones were yellow and gritty.

Portal Glands.—One showed in the cortex about half a dozen yellow gritty tubercles with fibrous margins, the largest the size of a wheat grain ; others were normal.

Kidneys.—Normal.

Suprarenal Bodies.—Each suprarenal body showed in the cortex a number of discrete caseous gritty tubercles, with fibrous margins, the largest about 2 mm. in diameter.

Tongue, Tonsils, Pharynx, Larynx, and Trachea.—Normal.

Small Intestines.—The Peyer's patches in the ileum were irregularly thickened and congested ; nothing abnormal seen on section.

Gastric, Mesenteric, and Colic Glands.—Normal.

Various Lymphatic Glands.

One coeliac gland showed in the cortex a yellow tubercle, 1·5 mm. in diameter.

A pancreatic gland contained two pinhead-sized calcareous tubercles.

All other lymphatic glands not mentioned above were normal.

Testes.—Normal.

VIRUS P XXVII. (Submaxillary Gland of a Pig).

CULTURE INOCULATIONS.

I.—February 22, 1906.

The strain was derived from the original material, and had been in cultivation a total period of 73 days.
The culture used was the 4th generation, 21 days old, on glycerin-serum.

CALF 390.

Subcutaneous.
Dose : 50·0 mg.
Killed : May 23, 1906.
90 days.

P.M.—Flattened local lesion, containing soft caseous nodules in a fibrous network. The left prescapular gland was composed of softened caseous material in a fibrous capsule. In the lungs were a caseous nodule and a few small grey tubercles. The thoracic and several abdominal glands contained scattered calcareous or caseous tubercles. The liver showed a few scattered grey tubercles; there were several caseous tubercles in each suprarenal.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
775	Intrav.	1·0 mg	D. 25 days	G. T.
776	Intrap.	1·0 mg.	D. 20 ,,	G. T.
777	Subcut.	1·0 mg.	K. 91 ,,	Local T. and nodule in lung.
778	Fed	1·0 mg.	D. 159 ,,	S. T.

GUINEA-PIG 1913.

Subcutaneous.
Dose : 1·0 mg
Killed : 113 days.

P.M.—Local tuberculosis only.

***CULTURES.**

Derived from lung and bronchial gland.

GUINEA-PIGS.

Material.	Number.	Method	Duration of Life.	Result.
E. of lung	2042	Intrap.	D. 23 days	G. T.
E. of bronchial gland.	2043	Intrap.	D. 29 ,,	G. T.
E. of spleen	2041	Intrap.	K. 65 ,,	Local T.
E. of prepectoral gland.	2046	Intrap.	K. 65 ,,	No T.
E. of suprarenal	2044	Intrap.	K. 65 ,,	Local T.
E. of portal gland.	2045	Intrap.	K. 65 ,,	No T.

* These cultures were mammalian in type.

***CULTURE.**

From lung of Rabbit 777. The 5th generation, 21 days old, was used on November 16, 1906, for inoculating :

FOWL 132.

Fed.
Dose : 10·0 mg.
Killed : 104 days.

P.M.—No tuberculosis.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1066	Intrav.	1·0 mg.	D. 14 days	Acute T.
1065	Intrav.	0·1 mg.	D. 24 .	G. T.
1067	Intrap.	1·0 mg.	D. 20 ,,	G. T.
1068	Intrap	0·1 mg.	D. 88 ,,	G. T.
1064	Subcut.	10·0 mg.	D. 112 ,,	G. T.
1063	Subcut.	1·0 mg.	D. 72 ,,	G. T.

GUINEA-PIGS.

Number.	Method.	Dose	Duration of Life	Result.
2204	Intrap.	1·0 mg.	D. 12 days	G. T.
2202	Intrap.	0·1 mg.	D. 18 ,,	G. T.
2203	Subcut.	1·0 mg.	D. 43 ,,	G. T.
2201	Subcut	0·1 mg.	D. 34 ,,	G. T.

* This culture was mammalian in type and resembled the bovine tubercle bacillus.

II.—March 30, 1906.

The strain was derived from the original material, and had been in cultivation a total period of 99 days
The culture used was the 5th generation, 21 days old.

FOWL 40.

Fed.
Dose Growth from one glycerin agar tube.
Died : 63 days.

P M.—Body fat A few foci in the intestines and greyish white tubercles in the liver.

III.—April 12, 1906

The strain was derived from the original material. Total duration of artificial cultivation, 122 days.
The 6th generation of culture was used, 15 days old.

PIG 140.

Subcutaneous.
Dose : 50 mg.
Killed when well : August 20, 1906.
130 days.

P.M. – Cystic local tumour, caseous and softening nodules in nearest glands. There were a few small soft yellow tubercles in the liver. The iliac, mesenteric, and ileo colic glands contained caseo-calcareous tubercles, moderately numerous. No tuberculosis elsewhere.

MONKEY 138.

Subcutaneous.
Dose : 10 mg.
Killed when well : August 30, 1906.
140 days.

P.M.—Normal throughout.

IV.—January 7, 1907.

The strain was derived from the original material, and had been in cultivation a total period of 392 days.
The culture used was the 8th generation, 67 days old.

CALF 492.

Subcutaneous.
Dose : 200·0 mg.
Killed : June 28, 1907
172 days.

P.M.—Small local lesion composed of caseo-purulent gritty masses enclosed in fibrous tissue. Left prescapular gland normal, and no tuberculosis elsewhere.

GUINEA-PIGS.

Material.	Number.	Method.	Duration of Life.	Result.
E. of local lesion.	2536	Intrap.	K. 150 days	Local T. only.
	2537	Intrap.	K. 150 ,,	
	2538	Subcut.	K. 150 ,,	

FOWLS.

Number.	Method.	Dose.	Duration of Life.	Result.
178	Intrav.	1·0 mg.	D. 29 days	Acute T.
180	Intrap.	1·0 mg	D. 173 ,,	Chronic T
182	Subcut.	100·0 mg.	D. 64 ,,	G. T.

PIG 140. Virus P XXVII.

Subcutaneous inoculation of culture derived from the original material.

Dose—50·0 milligrammes.

Date—April 12, 1906.

Weight at Inoculation—11·34 kilos.

Killed when in good health—August 20, 1906. [130 days after inoculation.]

Clinical Notes.

Four weeks after inoculation there was a circular subcutaneous tumour in the abdominal wall, measuring 5·6 cm. in diameter ; the overlying skin was not adherent to it. The adjacent lymphatic glands were moderately enlarged. A fortnight later the tumour was prominent, about 5·6 cm. in diameter, and apparently softened. The glands were slightly enlarged. No further change of any importance took place in the local conditions.

The pig remained well during the whole period of the experiment.

Temperature.

From April 12 to June 3 the temperature remained normal. On June 5 it rose to 39·7° C. and remained above normal for three weeks, reaching a maximum of 40·0° C. Subsequently it was normal until the pig was killed.

Tuberculin Test.

The pig was not tested subsequent to inoculation.

Weights.

	Kilos.
April 12	11·34
May 15	13·15
August 28	36·28

Total gain of weight during experiment.—24·94 kilos.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—In the subcutaneous tissues on the right side of the abdomen there was a rounded tumour measuring 6·5 by 5 cm. On section it consisted of a fibrous walled cyst containing caseo-purulent substance with small gritty foci. The internal wall was smooth.

Inguinal Glands.—The right inguinal glands were three in number. Two were enlarged and contained slightly gritty softening caseous nodules, replacing more than half the gland ; in the rest of the substance there were discrete caseous foci. The third gland appeared normal.

The left inguinal glands were normal.

Iliac Glands.—Four right iliac glands were enlarged and contained caseous and caseo-calcareous tubercles up to a hemp seed in size. They were mainly situated in the cortex, but were also scattered over the remainder of the gland substance.

The left iliac glands were normal.

Abdomen.

Omentum and Peritoneum.—Normal.

Liver.—In the liver there were a few sparsely scattered yellowish tubercles about the size of rape seed. They could be seen under the capsule and throughout the substance ; the majority were soft and a few were slightly gritty.

Portal Glands.—Normal.

Spleen.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Intestines.—Normal.

Mesenteric Glands.—All the mesenteric glands contained moderately numerous caseo-calcareous tubercles up to a millet seed in size, which in many places were confluent, forming nodules as large as a pea.

Glands of the Large Intestine.—Some of the numerous small glands on the large intestine contained single caseo-calcareous tubercles up to a pin's head in size.

Thorax.

Pleura.—Normal.

Lungs.—Normal.

Bronchial and Mediastinal Glands.—Normal.

Heart.—Normal.

Tongue, Pharynx, Palate, Tonsils.—Normal.

Submaxillary Lymphatic Glands.—Normal.

Various Lymphatic Glands.

Prescapular, Axillary, Prepectoral, Precrural.—Normal.

Microscopic Examination.

Tubercle from Liver.—Few tubercle bacilli seen.

RHESUS MONKEY 138. Virus P XXVII.

Subcutaneous inoculation of culture derived from the original material.

Dose—10·0 milligrammes.

Date of Inoculation—April 12, 1906

Killed—August 30, 1906 [140 days later.]

Clinical Notes.

Twenty-two days after inoculation there was a soft fluctuating prominent local tumour measuring 3·8 by 2·5 cm. As the animal was being caught on this day the tumour burst, a small opening appearing in the centre through which a quantity of greenish yellow pus was discharged.

On the forty-first day there was a collapsed local abscess (4·5 by 3·0 cm.), with an opening in the skin over the upper part discharging yellow pus. The axillary and inguinal glands were not enlarged. On the seventy-fifth day there was a healing ulcer 1 cm. in diameter at the seat of inoculation.

The monkey remained well during the experiment.

Temperature.

The temperature remained approximately normal throughout.

POST-MORTEM EXAMINATION.

Carcass in good condition.

Local Lesion.—At the seat of inoculation there was a small triangular cicatrix.

Axillary and Inguinal Glands.—Normal.

Thorax.

Pleura, Lungs, Heart, Thoracic Glands.—Normal.

Abdomen.

Peritoneum, Spleen, Liver, Kidneys.—Normal.

Alimentary Tract.

Tongue, Pharynx, Palate, Pharyngeal and Submaxillary Glands, Intestines and Mesenteric Glands.—Normal.

Various Lymphatic Glands.

Prescapular, Cervical, Lumbar, Iliac.—Normal.

CALF 492. Virus P XXVII.

Subcutaneous inoculation of culture derived from the original material.

Dose—200·0 milligrammes.

Date of Inoculation—January 7, 1907. [Age about 19 weeks.]

Killed when in good health—June 28, 1907. [172 days after inoculation.]

Temperature.

On the 28th day after inoculation there was a slight rise of temperature, lasting a week and reaching a maximum of 40·0° C., otherwise the temperature was normal during the experiment.

Weights.

	Kilos.
January 27, 1907	98·35
June 28, 1907	156·55

Gain in weight.—58·20 kilos.

Tuberculin Tests.

April 9, 1907. [92 days after inoculation.] Dose, 2·0 cc. of bovine tuberculin. No reaction.

April 30, 1907. [113 days after inoculation.] Dose, 4·0 cc. of avian tuberculin. Positive reaction. Rise of temperature, 1·4° C.

June 13, 1907. [157 days after inoculation.] Dose, 4·0 cc. of bovine tuberculin. No reaction.

POST-MORTEM EXAMINATION.

General condition good.

Local Lesion.—At the seat of inoculation in the subcutaneous tissues of the left side of the neck there was a localised non-infiltrating tumour about the size of a pheasant's egg; on section this consisted of bands of grey translucent tissue separating caseo-purulent gritty masses.

Left Prescapular Gland.—The left prescapular gland was normal in size and appearance.

Right Prescapular Gland.—Normal.

Prepectoral, Cervical, and Axillary Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—Normal.

Bronchial and Mediastinal Glands.—Normal.

Pericardium and Heart.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Intestines.—Normal.

Mesenteric Glands.—Normal.

Spleen.—Normal.

Liver.—Normal.

Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Renal, Lumbar, and Iliac Glands.—Normal.

Tongue, Larynx, Pharynx, and Tonsils.—Normal.

Various Lymphatic Glands.

Coeliac, Precrural, Gluteal, Popliteal, Submaxillary, Parotid, and Retro-pharyngeal Glands.—Normal.

Microscopical Examinations.

(Smear Preparations.)

Local Lesion.—Showed very numerous scattered and some small clumps of tubercle bacilli.

Spleen (substance)	Showed no tubercle bacilli.
Small Intestine (scraping) ...	
Mesenteric Gland (substance)	

Animals Inoculated.

Guinea-pigs 2536–2537 (Ip.), and 2538 (Sub.) killed 150 days after inoculation of E. of local lesion, showed local tuberculosis only.

VIRUS P XLIV. (Submaxillary Gland of a Pig).

CULTURE INOCULATIONS.

JANUARY 4, 1907.

The strain was derived from the original material, and had been in cultivation a total period of 188 days.
The culture used was the 5th generation, 22 days old.

FOWLS.

Number.	Method.	Dose.	Duration of Life.	Result.
172	Intrav.	0·01 mg.	D. 56 days	G. T.
174	Intrap.	1·0 mg.	D. 76 ,,	
176	Fed	10·0 mg.	D. 202 ,,	

GUINEA-PIGS.

Number.	Method.	Dose.	Duration of Life.	Result.
2284	Intrap.	1·0 mg.	K. 94 days	Local T.
2282	Intrap.	0·1 mg.	D. 94 ,,	Slight T.
2283	Subcut.	10·0 mg.	K. 152 ,,	Local T.
2281	Subcut.	1·0 mg.	K. 152 ,,	

CALF 490.

Subcutaneous.
Dose: 100·0 mg.
Killed: May 6, 1907.
122 days.

P.M.—Cyst at seat of inoculation containing muco-pus. In the prescapular gland were three cysts containing similar material. The liver showed one soft yellow focus. In three mesenteric glands there were soft yellow nodules and foci. The suprarenals each contained one or two greyish patches.

GUINEA-PIGS.

Material.	Number.	Method.	Duration of Life.	Result.
E. of local lesion.	2472	Intrap.	K. 75 days	Local T.
	2471	Subcut.	D. 102 ,,	
E. of prescapular gland.	2470	Intrap.	D. 9 ,,	No T.
	2469	Subcut.	D. 58 ,,	
E. of mesenteric gland.	2474	Intrap.	K. 102 ,,	Local T.
	2473	Subcut.	K. 75 ,,	Focus in bronchial gland.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1182	Intrav.	1·0 mg.	D. 32 days	G. T.
1186	Intrav.	0·1 mg.	D. 25 ,,	
1181	Intrav.	0·01 mg.	D. 53 ,,	
1183	Intrap.	1·0 mg.	D. 37 ,,	
1184	Intrap.	0·1 mg.	K. (ill) 117 days.	Chronic G. T.
1185	Subcut.	10·0 mg.	D. 69 days	Slight T.
1180	Fed	10·0 mg.	D. 323 ,,	G. T.
1179	Fed	1·0 mg.	K. 496 ,,	No T.

CALF 490. Virus P XLIV.

Subcutaneous inoculation of culture derived from the original material.

Dose—100·0 milligrammes.

Date of Inoculation—January 4, 1907. [Age nearly six months.]

Killed when in good health—May 6, 1907. [122 days after inoculation.]

Temperature.

The temperature remained normal throughout.

Weights.

	Kilos.
January 7, 1907	110·67
May 6, 1907	163·25

Total gain in weight.—52·60 kilos.

Tuberculin Tests.

April 9, 1907. [95 days after inoculation.] Dose 2·0 cc. of bovine tuberculin. No reaction.

April 30, 1907. [116 days after inoculation.] Dose 4·0 cc. of avian tuberculin. Positive reaction. Rise of temperature 1·8° C.

POST-MORTEM EXAMINATION.

General condition good.

Local Lesion.—At the seat of inoculation on the left side of the neck there was a tumour measuring 8·2 by 5·1 by 3·2 cm. On section it consisted of a fibrous walled cyst adherent to but not infiltrating the skin or muscle; it was lined by a thin layer of grey translucent tissue and was filled with muco-purulent substance in which were several small necrotic masses. The sides of the cavity were crossed by cords of translucent tissue.

Left Prescapular Gland.—The left prescapular gland measured 8·2 by 4·4 by 3·2 cm. On section there were two cysts occupying two-thirds of the gland filled with muco-pus similar to that in the local lesion with calcareous granules in it. The gland tissue forming the walls of the cyst was greyish white and fibrous. In the remaining one-third there was a similar cyst.

Right Prescapular Gland.—The right prescapular gland measured 6·3 by 3·2 by 1·2 cm. On section it was normal.

Prepectoral, Axillary, and Cervical Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—Normal.

Bronchial and Mediastinal Glands.—Normal.

Pericardium and Heart.—Normal.

Abdomen.

Peritoneum and Omentum.—Normal

Intestines.—Normal.

Mesenteric Glands.—In an anterior mesenteric gland there was a small pea-sized muco-purulent nodule (culture made). In another gland there was a patch consisting of soft yellow foci. A third gland contained several soft yellow slightly gritty and irregular nodules, the largest about the size of a millet seed.

Spleen.—Normal.

Liver.—In the liver there was a single soft opaque yellowish focus in which tubercle bacilli were not demonstrated.

Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—In the cortex of left suprarenal body there were two small semi-translucent greyish patches and a soft opaque nodule the size of a rape seed.

The right suprarenal body showed a similar patch.

Renal, Lumbar, and Iliac Glands.—Normal.

Tongue, Larynx, Pharynx and Tonsils.—Normal.

Various Lymphatic Glands.

Coeliac, Precrural, Gluteal, Popliteal, Submaxillary, Parotid, and Retro-pharyngeal Glands.—Normal.

Microscopical Examinations.

(Smear Preparations.)

Local Tumour.—Numerous tubercle bacilli; some small clumps.

Prescapular Glands.—Numerous tubercle bacilli.

Liver (tubercle).—No tubercle bacilli seen.

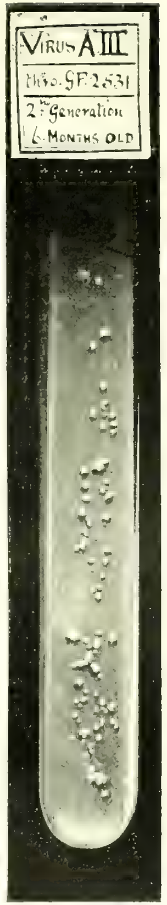
Suprarenal Body.—No tubercle bacilli seen.

Mesenteric Gland.—A few tubercle bacilli seen.

Animals Inoculated.

Two guinea-pigs inoculated from the prescapular gland remained healthy. Two from the local tumour and two from mesenteric gland developed local disease only.

CULTURES OF AVIAN TUBERCLE BACILLI OBTAINED FROM BIRDS.



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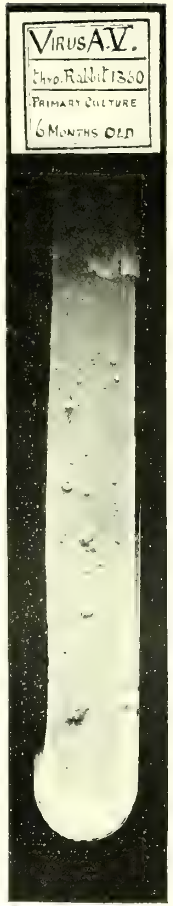

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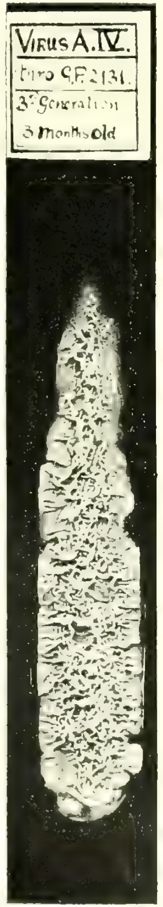

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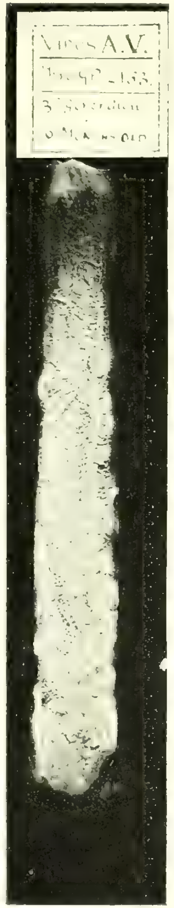

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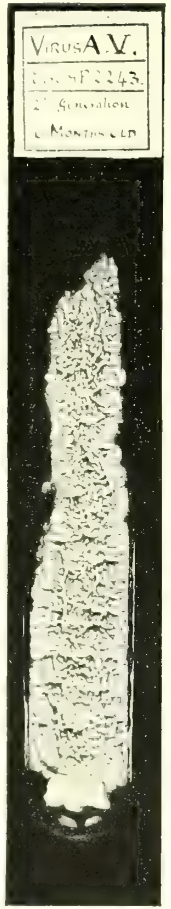

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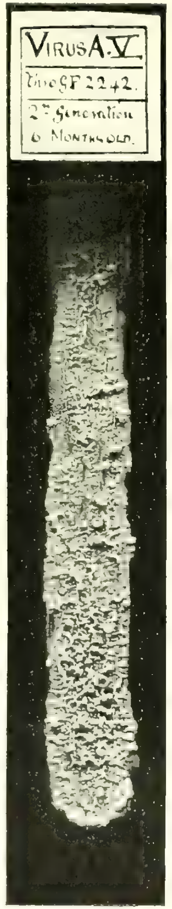

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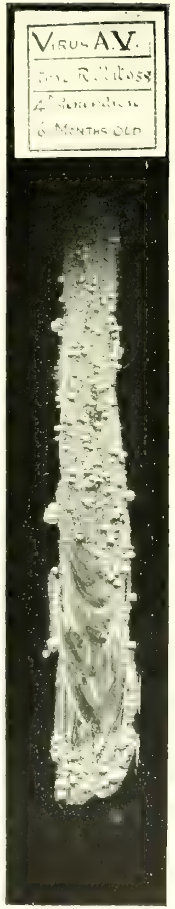

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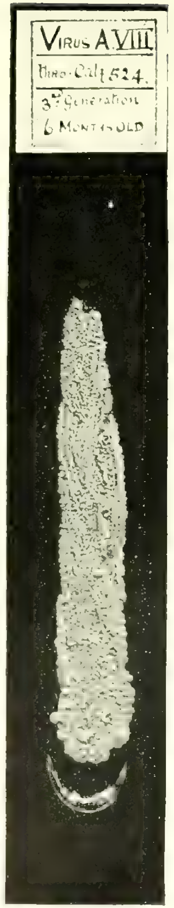

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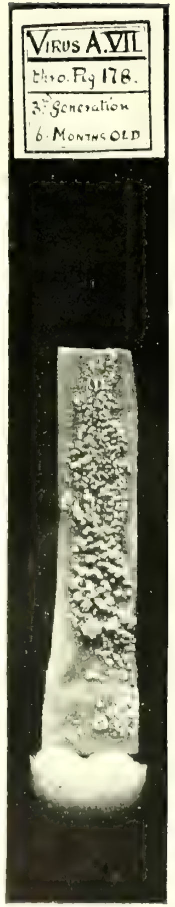


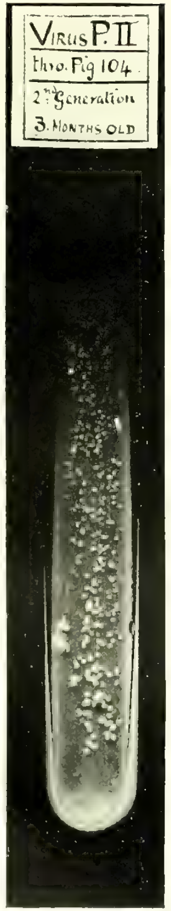
9.

1. *Irregular opaque whitish colonies on egg medium.*
2. *Primary culture on egg showing crater-like colonies.*

3–8. *Various types of growth on glycerin agar*

9. *Growth on glycerin potato.*

CULTURES OF AVIAN TUBERCLE BACILLI AND OF TUBERCLE BACILLI OF HUMAN AND BOVINE TYPES FROM THE PIG (ONE FROM AN ANTELOPE).



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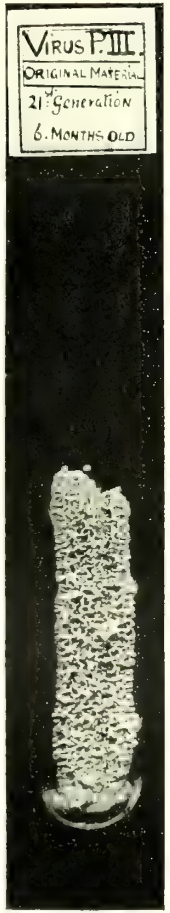

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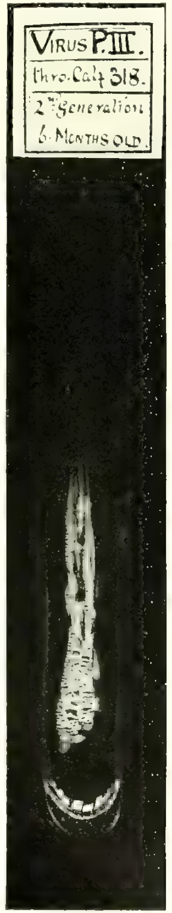

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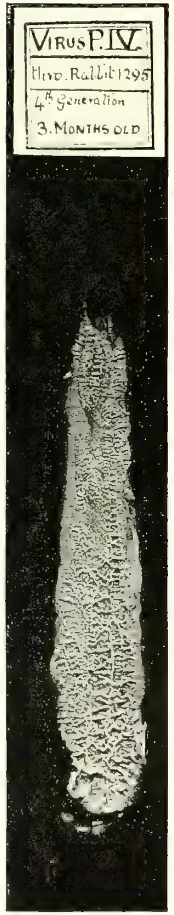

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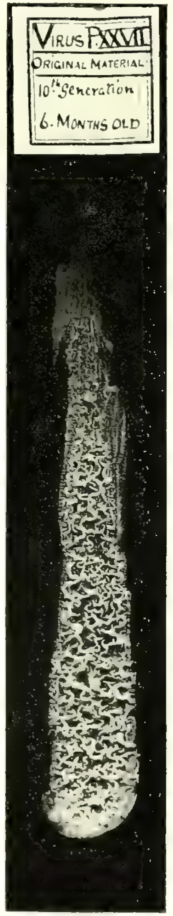

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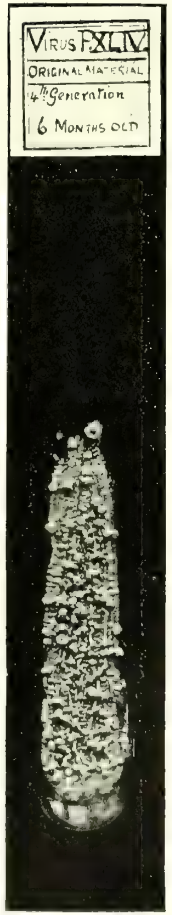

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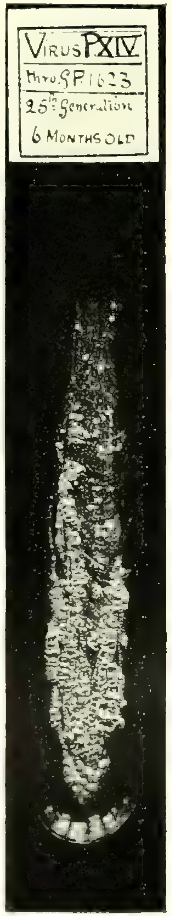

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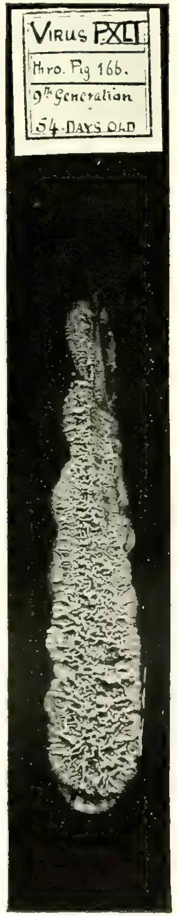

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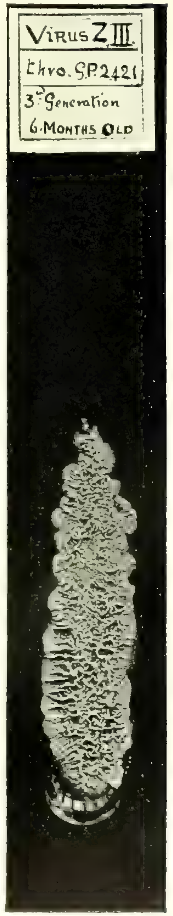

9.

1. Opaque whitish colonies on egg of avian tubercle bacilli from the pig.
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MODIFICATION EXPERIMENTS WITH TUBERCLE BACILLI DERIVED FROM ANIMALS OTHER THAN MAN.

BY

F. GRIFFITH M.B.

MODIFICATION EXPERIMENTS WITH TUBERCLE BACILLI DERIVED FROM ANIMALS OTHER THAN MAN.

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MODIFICATION EXPERIMENTS.

INTRODUCTION.

The experiments in this report have been made with a view to ascertain whether the apparently stable characters and properties of a variety of strains of tubercle bacilli can be altered by exposure to the influence of animal hosts of different species. The cultures of tubercle bacilli used have been isolated and studied in the research on natural tuberculosis in different species of animals other than man and include avian tubercle bacilli from both birds and pigs, bovine tubercle bacilli, and tubercle bacilli of slight virulence for the calf and rabbit (bacilli corresponding to the human tubercle bacillus of Group II.). The experimental animals employed have usually been such as might be presumed to be refractory to the particular cultures which it was sought to modify. For example, avian tubercle bacilli have been passed through the bodies of various mammals, and mammalian tubercle bacilli through fowls; slightly virulent tubercle bacilli obtained in culture from pigs and an antelope have been recovered after passage through calves and rabbits. Additional experiments have been made to test the effects of residence in dogs on bovine tubercle bacilli, and certain passage experiments on chimpanzees and baboons have been completed. In many instances the passage experiments have been performed with a number of animals in series, in others the bacilli used in the experiment have been recovered in culture after a single residence in the animal body.

SUMMARY OF RESULTS.

(*a*) EXPERIMENTS WITH AVIAN TUBERCLE BACILLI.

Two passage experiments on calves lasting from May 30, 1907, to May 20, 1908, have been made with Virus A. X. The first calf was inoculated intravenously with culture and the passage was continued in two series of calves with emulsions of either liver or spleen; all the calves were inoculated intravenously except for the final calves in each series which were inoculated subcutaneously. The details can be seen most readily by referring to the tables, pages 392–395. Numerous cultures were isolated from animals of various species in the course of the experiments and except for a single instance none showed any change in characters or increased virulence for guinea-pigs. The exception was Calf 574, a final calf in Passage No. 2, which showed when killed in good health after 109 days local tuberculosis and a caseous nodule in a bronchial gland. From the bronchial gland a culture was isolated which grew like a bovine tubercle bacillus and was virulent both for rabbits and guinea-pigs; from the prescapular gland a typical avian culture identical with that inoculated was obtained. The site of the lesion from which the mammalian culture was isolated suggests that the calf had been accidentally infected.

Two passage experiments were made with rabbits and guinea-pigs, the bacilli being passed from animal to animal in emulsions of tuberculous tissues; the rabbits were introduced alternately in order to increase the number of active tubercle bacilli available for inoculation into the guinea-pigs.

Of these two experiments one with Virus A. V. (page 396) lasted from July 4, 1906, to November 6, 1908, and the two guinea-pigs finally inoculated showed in one case a single nodule in an inguinal gland and in the other no tuberculosis, so that cultures could not be obtained from them, but the culture from the preceding animal, a rabbit, was avian in character. The other experiment, with Virus P. XXI., (page 397) lasted from May 22, 1906, to November 6, 1908. Numerous cultures were isolated from animals in both these passage experiments and in none was there any change in characters or increase in their virulence for the guinea-pigs.

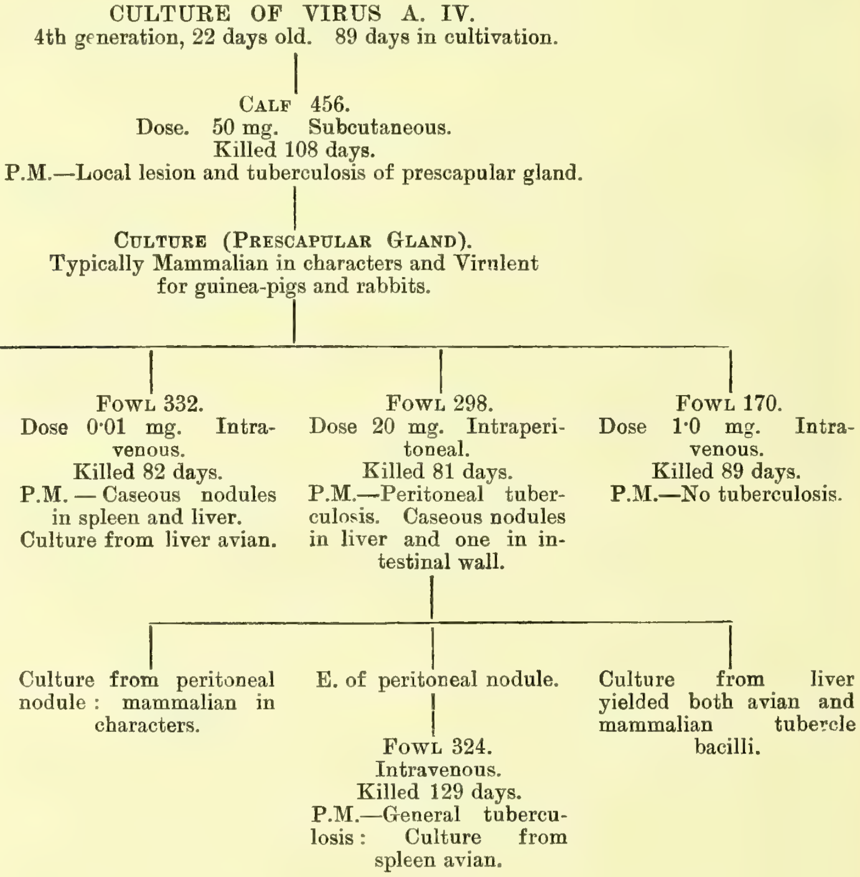
In addition to the passage experiments mentioned above cultures have been obtained from lesions in many of the animals inoculated for test purposes with avian tubercle bacilli and the details concerning the duration of life of the animals and the sources of the cultures investigated have been collected into the form of tables (pages 398–402). The results in brief are as follows.

Cultures have been obtained of bacilli which remained unchanged after single residence in the following animals:—1 Horse, 22 Calves, 6 Goats, 12 Pigs, 9 Monkeys, 3 Cats, 1 Dog, 4 Rats, 3 Mice, 34 Rabbits, and 74 Guinea-pigs, a total of 169 animals.

From seven animals cultures were grown which differed in characters from those which supplied the bacilli that were inoculated; these animals are given in a tabular summary (page 402) and in addition they are considered in detail below.

(1)

Calf 456 was inoculated subcutaneously with culture of Virus A. IV. and was killed 108 days later. The post-mortem examination showed only a local lesion and tuberculosis of the prescapular gland. From the prescapular gland a culture of mammalian tubercle bacilli was obtained which was virulent for guinea-pigs and rabbits. At the same time as Calf 456 four guinea-pigs were inoculated with the same suspension of culture of Virus A. IV., and these when killed after 180 days had slight local tuberculosis only, thus showing that this original culture was free from mammalian tubercle bacilli. The culture that was obtained from the prescapular gland of Calf 456 was in cultural characters apparently pure mammalian and attempts to separate from it two types of bacilli by methods of subculture failed; nevertheless out of four fowls inoculated with it three developed generalised tuberculosis and from two of these typical avian cultures were ultimately obtained (*see* table below).



CULTURE OF VIRUS A. IV.
4th generation, 22 days old. 89 days in cultivation.

CALF 456.
Dose. 50 mg. Subcutaneous.
Killed 108 days.
P.M.—Local lesion and tuberculosis of prescapular gland.

CULTURE (PRESCAPULAR GLAND).
Typically Mammalian in characters and Virulent for guinea-pigs and rabbits.

FOWL 334.
Dose 0·1 mg. Intravenous.
Killed 82 days.
P.M.—Caseous nodule in lung and two in liver.

FOWL 332.
Dose 0·01 mg. Intravenous.
Killed 82 days.
P.M. — Caseous nodules in spleen and liver.
Culture from liver avian.

FOWL 298.
Dose 20 mg. Intraperitoneal.
Killed 81 days.
P.M.—Peritoneal tuberculosis. Caseous nodules in liver and one in intestinal wall.

FOWL 170.
Dose 1·0 mg. Intravenous.
Killed 89 days.
P.M.—No tuberculosis.

Culture from peritoneal nodule: mammalian in characters.

E. of peritoneal nodule.

FOWL 324.
Intravenous.
Killed 129 days.
P.M.—General tuberculosis: Culture from spleen avian.

Culture from liver yielded both avian and mammalian tubercle bacilli.

(2 and 3)

Calf 390 was inoculated subcutaneously with culture of Virus P. XXVII. (an avian tubercle culture) and when killed after 90 days showed caseous nodules at the seat of inoculation and caseation and softening of the prescapular gland. In the lungs there were a few grey tubercles and a bean sized caseous nodule; the thoracic and several abdominal lymphatic glands contained caseous tubercles: there were a few grey tubercles with opaque centres in the liver and a few caseous gritty tubercles in the suprarenal bodies. Typical avian cultures were obtained from the prepectoral gland, portal gland and suprarenal body. From the lung a mammalian culture growing like a bovine tubercle culture was obtained and from the bronchial gland both avian and mammalian types were obtained.

Goat 36 inoculated subcutaneously with culture of Virus P. II. (an avian tubercle culture), when killed after 131 days, showed at the seat of inoculation a fibrous walled cyst with soft caseous contents and a soft caseous mass in the prescapular gland. In the lungs there was a fibrous nodule containing a pea-sized cavity filled with caseo-pus (smear showed T. B.), two smaller nodules of similar character and scattered calcareous tubercles. There were caseous nodules in the thoracic glands up to a centimetre in diameter and a calcareous tubercle in a mesenteric gland. From the lung a culture was obtained typically mammalian in characters, resembling a bovine tubercle bacillus.

That these two animals, Calf 390 and Goat 36, became accidentally infected with mammalian tubercle bacilli there can in my view be but little doubt.

(4 and 5)

Rabbit 777 was inoculated subcutaneously with culture of Virus P. XXVII (an avian tubercle culture) and when killed after 91 days showed a cystic local lesion and a caseating nodule in the lung from which a typical bovine tubercle bacillus was obtained.

Two guinea-pigs, Nos. 1856 and 1857, were inoculated, one subcutaneously the other intraperitoneally, with an emulsion made from the inguinal gland of Pig 106 (inoculated with Virus P. II., an avian tubercle culture). The subcutaneously inoculated animal developed slight tuberculosis of the usual avian type. The intraperitoneal animal, G.P. 1857, died after 119 days and had general tuberculosis. From its bronchial gland a culture of mammalian tubercle bacilli, bovine in character, was obtained which was virulent for guinea-pigs and rabbits.

In these two cases, Rabbit 777 and G.P. 1857, the nature and site of the tuberculous lesions from which the cultures were isolated are consistent with the view that the animals became accidentally infected with bovine tubercle bacilli.

(6)

Guinea-pig 1612 was inoculated subcutaneously with an emulsion of the spleen of Calf 282 (Virus P. III., avian culture) and died after 150 days. The post-mortem examination showed a purulent local lesion and a nodule in the inguinal gland; in the spleen there was a single grey tubercle. The right bronchial gland was moderately enlarged and showed three quarters of its substance replaced by softening caseous tissue ; a smaller gland was caseous throughout. From the bronchial gland a culture was obtained which resembled culture of human tubercle bacilli, virulent for guinea-pigs and slightly virulent for calves and rabbits. A fowl fed with 25 milligrammes of the culture remained healthy.

This result is difficult to explain ; more probably it was due to contamination than to modification. If modification occurred then it must have taken place in Guinea-pig 1612 since the fellow guinea-pig, No. 1613, inoculated intraperitoneally at the same time and with the same emulsion, developed only slight disease after 133 days and an avian culture was obtained from a nodule in its omentum.

(7)

Monkey 118 inoculated subcutaneously with culture of Virus P. II. (an avian culture) when killed after 98 days had general tuberculosis, severe in the lungs. The culture obtained from the lung was mammalian in type growing like a bovine tubercle bacillus, and was virulent for guinea-pigs and rabbits. A fowl fed with 20 milligrammes remained healthy. The culture gained directly from the local lesion was avian in type, while that isolated from a guinea-pig, which was inoculated with an emulsion of the local lesion and developed general tuberculosis, was mammalian in character resembling that obtained from the lung. Monkey 118 was tested with tuberculin before inoculation and three other monkeys from the same lot were inoculated (1) and fed (2) with the same culture. They remained well and when killed after 112 days showed only very slight disease and avian tubercle bacilli were obtained from their lesions. They were isolated in the same house as No. 118 thus showing that the opportunity for accidental infection was slight. This case must remain in doubt, though the balance of probability is against modification.

(*b*) EXPERIMENTS WITH COLLODION CAPSULES.

In these experiments collodion sacs containing cultures of tubercle bacilli have been inserted into the peritoneal cavities of animals selected as resistant to the particular types of bacilli used. The object was to ascertain whether the action of the tissue juices which might permeate the collodion membrane had ability to cause any alteration in the characters or virulence of the bacilli contained within the capsules.

The capsules were made in the following way. A small test-tube such as that from a Durham's fermentation tube was dipped in a solution of collodion which was allowed to dry and, after being softened in spirit, was stripped off in the form of a sac. At first the tubes were dipped several times and allowed to dry each time but the capsules resulting were very firm and hard so as to be little permeable. Subsequently the tubes were dipped once only and the collodion was allowed to become just firm ; these capsules were soft and very permeable but they had the disadvantage of contracting after insertion into the peritoneal cavity, and frequently they ruptured.

Experiments were made in this way with cultures both of avian and mammalian tubercle bacilli. The capsules containing avian tubercle bacilli were inserted into the peritoneal cavities of guinea-pigs, those containing mammalian tubercle bacilli into a like situation in fowls and pigeons.

The animals were killed after varying periods and cultures were made from the contents of the capsules ; occasionally also the contents of the capsules were used for the inoculation of animals. The results are summarised below.

Fowls and Pigeons.

(*Tabular Summary, pages* 404–406.)

Cultures of 10 several mammalian viruses were used in the 36 collodion capsule experiments performed, 16 on fowls and 20 on pigeons. The duration of the experiments ranged from 55 to 186 days. In several instances the culture obtained from one capsule was, after a period in subculture on serum, again used for insertion into other capsules, so that certain cultures were in the peritoneal cavities of birds for periods varying up to 475 days. In 10 of the experiments with fowls and in 10 with pigeons cultures were obtained and were found to be unchanged in characters ; in the remaining 16 instances cultures could not be grown from the capsules ; apparently the bacilli within them were dead.

Guinea-pigs.

(*Tabular Summary, pages* 406–408.)

Cultures of five avian viruses were used and 25 capsule experiments were performed on guinea-pigs. The duration of residence of the capsules in individual guinea-pigs ranged up to 253 days and the total period during which the cultures were in the peritoneal cavities of series of guinea-pigs varied up to 424 days. In only two instances was there failure to obtain growth of culture from the capsules : from all the other capsules cultures were obtained and were found to be unchanged.

Portions of the contents of the capsules were inoculated in 12 cases intraperitoneally or subcutaneously into guinea-pigs and the cultures obtained from these guinea-pigs showed with a single exception no alteration in characters or virulence for guinea-pigs.

The exceptional case was Guinea-pig 2531 which was inoculated with the contents of the capsule from Guinea-pig 2182 (Virus A.V.) and when killed after 120 days showed only slight disease consisting of purulent nodules in the omentum. The culture obtained direct from the capsule from G.P. 2182 was unchanged but the culture obtained from an omental nodule in G.P. 2531 was mammalian (bovine) in character and virulent for guinea-pigs. In the primary culture tube sown from this nodule only two colonies grew and both were mammalian in type : the rest of the bacilli shown by microscopical examination to be spread over the medium were apparently dead. Three fowls were tested with this culture : two inoculated intravenously developed slight general tuberculosis after 82 days, one inoculated intramuscularly had a local lesion and a nodule in the lung. No cultures were obtained from these three fowls. Two more fowls were inoculated, both intramuscularly, with the culture after it had been 300 days longer in artificial cultivation. They were killed after 59 days and each showed a miliary tubercle in the liver and a local lesion from which mammalian cultures were obtained. This result stands alone and, although numerous experiments on identical lines have been performed, its like has not occurred.

(*c*) PASSAGE EXPERIMENTS ON FOWLS WITH MAMMALIAN TUBERCLE BACILLI.

Two passage experiments on fowls (pages 409–410) have been made with cultures of Virus B. XXVI. One lasted from July 26, 1906, to February 18, 1909, and the last animal inoculated was a pigeon in which only slight local disease was produced ; the culture obtained from it was typically mammalian in characters resembling that with which the experiment was begun. At one stage of this passage experiment four fowls were inoculated with culture from the local lesion of Fowl 202 ; from three of them cultures of bovine tubercle bacilli were obtained, with one of which the passage was continued. The fourth fowl, No. 342, killed after 118 days, had general tuberculosis with large ulcerated nodules in the intestines and an avian culture was obtained from its liver. This was clearly a case of naturally acquired tuberculosis of the fowl.

The second passage experiment lasted from July 26, 1906, to February 16, 1909. The last two animals inoculated were pigeons in which the disease was limited to the seat of inoculation and from which cultures were obtained identical with that inoculated into the first fowl.

Tabular summaries have been made of all the fowls inoculated with mammalian tubercle bacilli from whose lesions cultures were obtained, and a list is given of fowls in regard to which attempts to raise cultures failed (pages 411–415). Cultures were obtained from lesions in 50 fowls inoculated by various methods and in none was there any change in cultural characters. There was a single exceptional case, not included in the tables. Fowl 282, inoculated intraperitoneally with culture of Virus B. XII. and killed after 157 days, showed slight peritoneal tuberculosis and a nodule in the spleen from which both avian and mammalian (bovine) tubercle bacilli were isolated ; no intestinal tuberculosis was seen in this fowl. Fowl 284 inoculated intramuscularly with the same culture showed after 157 days a local lesion only.

Thus out of 66 fowls, which were inoculated with mammalian tubercle bacilli derived from various sources, and in which the tuberculous lesions were investigated culturally, from two only were cultures isolated differing from those inoculated. One of those, No. 342, was obviously a case of natural avian tuberculosis and there is strong presumption that the other fowl, No. 282, was similarly affected.

(*d*) PASSAGE EXPERIMENTS ON DOGS WITH BOVINE TUBERCLE BACILLI.

In a previous report (Second Interim Report, Appendix, Vol. III. Page 89), the results have been given of a number of inoculation and feeding experiments on dogs with cultures of bovine tubercle bacilli. In two cases, Dog 18 and Dog 50, cultures were obtained with characters differing from those of the cultures inoculated. Dog 18 was fed with an emulsion of tuberculous material containing bovine tubercle bacilli and Dog 50 with culture of bovine tubercle bacilli. From the mesenteric gland of the former and from the lung of the latter cultures of tubercle bacilli were obtained resembling tubercle bacilli of human origin (Group II.). From the rest of the dogs cultures were obtained which showed no changes of importance in characters or virulence ; one culture grew a little better than before inoculation but still resembled a bovine tubercle bacillus.

In view of the results obtained with Dogs 18 and 50 it was decided to perform further experiments on dogs and to continue the dog passage experiments already begun in order to determine whether residence in the tissues of a dog could modify the bovine tubercle bacillus.

Eight dogs were fed with doses ranging from 40 to 100 milligrammes of culture of bovine tubercle bacilli and were killed in from 103 to 302 days. In all, the tuberculous lesions were very slight and from five it was impossible to obtain cultures. From the remaining three, killed after 103, 274 and 302 days respectively, cultures were obtained and proved unchanged in characters and virulence. Nine dogs were inoculated by various methods and of these three (two inoculated intravenously and one intraperitoneally) died of general tuberculosis. Cultures were recovered from eight and they showed no alteration in their characters. (*See* Tabular Summary, pages 422–423).

The details of the passage experiments in which cultures were passed through series of dogs are given on pages 416–421.

The following is a brief summary of the results. The experiments were performed wholly with cultures and the cultures isolated at various stages were tested in rabbits. In none of the experiments was there any alteration in characters or virulence.

In the first experiment six dogs were used, three in series, and the total duration was 320 days (from March 7, 1906, to January 21, 1908). In the second three dogs in series were used and the total duration was from October 30, 1905, to November 30, 1907. The third was similar and lasted from May 20, 1905, to November 13, 1907. The fourth lasted from September 4, 1905, to November 22, 1907.

In the fifth experiment ten dogs were used, five being in a direct line. It lasted 1,122 days, from June 8th, 1905, to July 4th, 1908.

(*e*) PASSAGE EXPERIMENTS ON CHIMPANZEES AND BABOONS.

The chimpanzee passage experiment detailed in the Appendix to the 2nd Interim Report, Vol. III., page 94, in which the culture of Virus B. IV. was passed through a series of chimpanzees has been terminated, and no change in the culture has occurred (page 424). There were five chimpanzees in the series, three were fed and two were inoculated subcutaneously. The virus was exposed to the influence of chimpanzee tissues for a total period of 542 days, the whole passage experiment lasting from October 28, 1904, to March 8, 1907.

A passage experiment on baboons with culture of Virus B. I. (page 424) lasted from January 22, 1904, to March 26, 1907 (*see* 2nd Interim Report, Vol. III., page 96). Three baboons were used and the virus was in their bodies for a total period of 375 days. A culture isolated from the first baboon grew better than the original culture but still was within the bovine range. There was no subsequent change and the culture continued to be fully virulent.

(*f*) EXPERIMENTS WITH TUBERCLE BACILLI OF SLIGHT VIRULENCE FOR THE CALF AND RABBIT.

An easy growing tubercle bacillus of slight virulence for the rabbit and calf similar in all respects to the human tubercle bacillus of Group II. was isolated from an antelope, Virus Z. III., and an attempt was made to increase its virulence. It was considered that residence in the tissues of the antelope in which the bacillus had produced severe disease might have rendered it capable of being increased in virulence for the calf and rabbit.

Three passage experiments were performed with rabbits and guinea-pigs (pages 428–430). One began with a rabbit inoculated with the original material from the antelope, and was continued with emulsions of tuberculous material passed from animal to animal, lasting from October 4, 1906, to September 1, 1908, a total period of 698 days. The final culture, as well as those obtained from intermediate animals, was unchanged. The other two experiments, begun with culture from the original material, were negative also.

Two passage experiments on calves and rabbits with culture of Virus P. IV., which grew like a human tubercle bacillus (Group II.) and was slightly virulent for calves and rabbits, resulted in no change in the cultures derived from the calves. The culture, however, from the Calf 312 in the 2nd Passage was inoculated into a series of rabbits, from two of which were obtained tubercle bacilli with the characters of bovine tubercle bacilli and fully virulent for rabbits. This is the only example where a bacillus of slight virulence for rabbits was apparently increased in virulence by residence in the bodies of rabbits. (*See* pages 431–432.)

Cultures were obtained unchanged from calves and rabbits inoculated with cultures of Viruses Z. III., P. IV., P. XLI., and P. XLVI., all of which were viruses of slight virulence for the calf and rabbit and identical with human tubercle bacilli (Group II.); these animals are collected together in the form of a tabular summary (page 435).

(*g*) COMPARATIVE INOCULATION EXPERIMENTS ON RABBITS WITH SERUM AND GLYCERIN SERUM CULTURES.

These inoculation experiments with cultures of three bovine viruses (B. IV, B. IX, and B. XI) were performed in order to ascertain whether long residence on artificial media had produced any attenuation in their virulence for rabbits. The cultures, grown on pure serum since they were first obtained, are compared with cultures grown for a considerable period on glycerin serum. The results have shown in the first place that there is no difference in virulence between cultures grown on pure serum and on glycerin serum and in the second place that there is little if any attenuation in virulence for rabbits caused by residence on artificial media after periods of 1189, 1244 and 1487 days. (*See* page 434.)

CONCLUSIONS.

The results of the experiments detailed in this report lend little support to the surmise that modification of the recognized types of bacilli can be experimentally induced by passage through animals. In the majority of the numerous experiments in which cultures of mammalian and of avian tubercle bacilli have been obtained after residence of the bacilli of experiment in a single animal or after passage through a series of animals no change whatever has occurred either in cultural characters or virulence. It has happened in a few instances that cultures differing widely from those inoculated have been obtained from one or other animal, but where these occurrences are not clearly referable to complication by natural tuberculosis they are so exceptional that the presumption is against modification of the bacilli having been effected.

CHART OF THE INTRAVENOUS PASSAGE EXPERIMENT WITH VIRUS A. X.

VIRUS A. X.
(Lung of a Fowl.)
No. 1.

The strain was derived from the original material, and had been in cultivation a total period of 191 days. The subculture used was the 4th generation, 21 days old.

CULTURE INOCULATION.
May 30, 1907.
CALF 548.
Intravenous.
Dose : 100·0 mg.
Killed when dying : July 9, 1907.
40 days.
P.M.—Acute tuberculosis.

Emulsion of spleen.

CALF 554.
Intravenous.
Dose : 10·0 cc.
Died : August 13, 1907.
35 days.
P.M.—Acute tuberculosis.

GUINEA-PIGS.

Material.	Number.	Duration of Life.	Result.	*Cultures.*
Emulsion of lung.	2560	K. 188 days	Local T. only.	*None.*
	2561	K. 188 "		*None.*
Emulsion of spleen.	2558	K. 188 "		*No growth.*
	2559	K. 188 "		*No growth.*

Emulsion of liver, containing numerous T.B.

CALF 560.
Intravenous.
Dose : 9·0 cc.
Died: September 23, 1907.
40 days.
P.M.—Acute tuberculosis. *Cultures from liver and lung were avian in character.*

GUINEA-PIGS.

Number.	Duration of Life.	Result.	*Cultures.*	
			Source.	*Characters.*
2589	D. 37 days	Sub-acute avian T.	*Spleen.*	*Avian.*
2591	D. 39 "		*None.*	—
2590	K. 154 "	Local T.	*None.*	—

Emulsion of liver, containing numerous T.B.

CALF 564.
Intravenous.
Dose : 9·0 cc.
Died : November 7, 1907.
45 days.
P.M.—Acute tuberculosis. *Cultures from liver and mediastinal gland were avian in character.*

GUINEA-PIGS.

Number.	Duration of Life.	Result.	*Cultures.*	
			Source.	*Characters.*
2628	D. 58 days	Sub-acute avian T.	*None.*	—
2626	D. 49 "		*Spleen and omentum.*	*Avian.*
2627	K. 169 "	Local T.	*None.*	—

GUINEA-PIG 2905.
Intraperitoneal. Emulsion of spleen from Guinea-pig 2626.
Died : 143 days.
P M.—Nodules in omentum containing pus. Animal otherwise healthy.

Emulsion of liver containing moderately numerous T.B.

CALF 570.
Intravenous.
Dose : 5·0 cc.
Died : December 9, 1907.
31 days.
P.M.—Acute tuberculosis.

GUINEA-PIGS.

Material.	Number.	Duration of Life.	Result.	*Cultures.*	
				Source.	*Characters.*
Emulsion of liver.	2900	D. 55 days	Acute avian T.	*Sternal gland.*	*Avian.*
	2898	D. 122 "	Local T.	*Scapular gland.*	*No growth.*
	2899	D. 118 "		*None.*	—
Emulsion of mediastinal gland.	2901	D. 119 "		*None.*	—

(*Table continued on opposite page.*)

(**CALF 570**, *continued from preceding page.*)

Emulsion of liver in which T. B. were moderately numerous.

GOAT 50.

Subcutaneous.
Dose : 6·0 cc.
Killed : August 5, 1908.
240 days.

P.M.—At the seat of inoculation there were fibrous nodules with caseo-purulent gritty contents. Left prescapular gland partly softened, caseous, and gritty.

Emulsion of prescapular gland.

GUINEA-PIGS.

Number.	Duration of Life.	Result.
3311	K. 60 days	Local T.
3313	K. 60 „	Local T.
3312	K. 60 „	No T.

CALF 572.

Subcutaneous.
Dose : 9·0 cc.
Killed : May 20, 1908.
163 days.

P.M.—Fibro-caseo-calcareous local tumour. Softened caseous nodules in prescapular gland. There was a single tubercle in the lung, the liver, a suprarenal body, and a mesenteric gland. *Cultures from prescapular gland and suprarenal body were avian in character.*

GUINEA-PIGS.

Material.	Number.	Duration of Life.	Result.	Cultures.	
				Source.	*Characters.*
Emulsion of local lesion.	3172	D. 31 days	Sub-acute avian T.	*None.*	—
Emulsion of prescapular gland (1).	3174	K. 105 „	Local T.	*Omentum.*	*Avian.*
	3173	K. 105 „	Local T.	*Inguinal gland.*	*Avian.*
Emulsion of prescapular gland (2).	3177	K. 105 „	Local T.	*Omentum*	*Avian.*
	3175	K. 105 „	Local T.	*Inguinal gland.*	*Avian.*
	3176	K. 105 „	Local T.	*None.*	—

GUINEA-PIGS.

Material	Number.	Duration of Life.	Result.	*Cultures.*
Emulsion of liver.	2944	D. 28 days	Local T. T.B in sternal gland.	*Avian.*
	2945	D. 136 „		*None.*
Emulsion of lung.	2946	D. 149 „		*None.*
Emulsion of spleen.	2947	D. 101 „	Local T.	*None.*

CALF 576.

Subcutaneous.
Dose : 7·0 cc.
Killed : May 20, 1908.
163 days.

P.M.—Slight thickening only at seat of inoculation ; some caseo-calcareous granules in prescapular gland ; one left cervical gland partly caseo-calcareous. Many mesenteric and colic glands each contained a few caseo-calcareous tubercles or a small caseous patch. *Cultures from prescapular, cervical, and mesenteric glands were avian in character.*

GUINEA-PIGS.

Material.	Number.	Duration of Life.	Result.	Cultures.	
				Source.	*Type.*
Emulsion of prescapular gland.	3179	K. 105 days	Local T.	*Peritoneal nodule.*	*Avian.*
	3178	K. 105 „	Local T.	*Inguinal gland.*	*Avian.*
Emulsion of cervical gland.	3182	K. 105 „	Local T.	*None.*	—
	3181	K. 105 „	Local T.	*Inguinal gland.*	*Avian.*
Emulsion of mesenteric gland.	3180	K. 105 „	No T.	*None.*	—

MONKEY 192.

Subcutaneous.
Dose : 4·0 cc.
Died : February 2, 1908.
55 days.

P.M.—Caseo-purulent tumour at seat of inoculation ; two opaque foci in one axillary gland ; one translucent tubercle in the lung ; no tuberculosis elsewhere. *Culture from local lesion was avian.*

Emulsion of local lesion.

GUINEA-PIGS.

Number.	Duration of Life.	Result.
3009	D. 16 days	Acute avian T.
3010	D. 31 „	Local T.

INTRAVENOUS PASSAGE EXPERIMENT—*continued.*

VIRUS A. X. (Lung of a Fowl.)

No. 2.

Inoculation of Emulsion of spleen of Calf 548 (*see* Table, Page 392).
JULY 9, 1907.

CALF 550.
Intravenous.
Dose : 20·0 cc.
Died : August 14, 1907.
36 days.

P.M.—Acute tuberculosis. *Culture from liver was avian.*

Emulsion of spleen, containing numerous T.B.

GUINEA-PIGS.

Number.	Duration of Life.	Result.	Cultures.	
			Source.	Characters.
2592	D. 38 days	Sub-acute avian T.	*None.*	—
2594	D. 44 „		*Spleen.*	*Avian.*
2593	K. 153 „	Local T.	*None.*	—

CALF 562.
Intravenous.
Dose : 10·0 cc.
Died : September 15, 1907.
32 days.

P.M.—Acute tuberculosis.

Emulsion of liver, containing moderately numerous T.B.

GUINEA-PIGS.

Number.	Method.	Duration of Life.	Result.
2620	Subcut.	D. 5 days	Sub-acute infection (short bacilli).
2621	Intrap.	D. 5 „	

CALF 558.
Intravenous.
Dose : 5·0 cc.
Died : October 31, 1907.
45 days.

P.M.—Acute tuberculosis. *Cultures from liver, portal, and bronchial glands were avian.*

Emulsion of liver.

GUINEA-PIGS.

Material.	Number.	Duration of of Life.	Result.	Cultures.	
				Source.	Characters.
Emulsion of liver.	2868	D. 58 days	Local T.	*None.*	—
	2867	D. 151 „		*None.*	—
Emulsion of portal gland.	2869	D. 127 „		*Omentum.*	*Avian.*
	2870	D. 62 „		*Local lesion.*	*Avian.*
Emulsion of bronchial gland.	2871	D. 37 „	Sub-acute avian T.	*None.*	—

CALF 566.
Intravenous.
Dose : 5·0 cc.
(150,000,000 T.B.)
Killed when ill : Dec. 13, 1907.
43 days.

P.M.—Severe tuberculosis of the lungs, the thoracic, portal, and mesenteric glands ; the small intestine, two cervical, and two pharyngeal glands were also affected. *Avian cultures were isolated from the liver, ileo-colic, mesenteric, and portal glands.*

(*Table continued on opposite page.*)

(CALF 566, *continued from preceding page.)*

Emulsion of liver. Spleen. Emulsion of mediastinal gland. Emulsion of mesenteric glands.

GUINEA-PIGS.

Material.	Number.	Method.	Duration of Life.	Result.
Emulsion of liver.	2952	Subcut.	D. 110 days	No T.
Emulsion of mesenteric gland.	2953	Subcut.	K. 115 „	Local T.

RABBITS.

Material.	Number.	Dose.	Duration of Life.	Result.	Cultures.	
					Source.	*Characters.*
Emulsion of liver.	1599	10·0 cc.	K. 160 days	Chronic T.	*None.*	—
	1597	10·0 cc.	K. 343 „	Local T.	*Scapular gland.*	*Avian.*
Emulsion of mediastinal gland.	1598	1·0 cc.	D. 24 „	G. T.	*None.*	—

CALF 574.

Subcutaneous.

Dose: 10·0 cc. (no T.B. seen).

Killed: March 31, 1908.

109 days.

P.M.—No local lesion. A few small caseous tubercles in prescapular gland. One glassy tubercle in lung. In a left bronchial gland there was a caseous nodule and a few tubercles around it. *Culture from prescapular gland was avian.*

CULTURE INOCULATIONS.

August 1, 1908.

The cultures used were the 4th generation, 10 days old, and had been in cultivation a total period of 123 days.

*Culture from Bronchial gland.

Number.	Method.	Dose.	Duration of Life.	Result.
G.P. 3309	Subcut.	0·01 mg.	D. 9 days	No. T.
G.P. 3310	Subcut.	0·1 mg.	D. 55 „	G. T.
Rabbit 1865	Subcut.	1·0 mg.	K. 121 „	G. T. severe.
Rabbit 1866	Subcut.	10·0 mg.	D. 95 „	Chronic T. *Culture mammalian.*

Culture from Prescapular gland. *Avian in character.*

Number.	Dose.	Duration of Life.	Result.
G.P. 3306	0·1 mg.	K. 96 days	Local T. A few nodules in lungs. *Avian culture isolated.*
G.P. 3307	10·0 mg.	K. 96 „	Local T. *Avian culture.*
G.P. 3308	10·0 mg.	K. 87 „	Local T.

*This culture was mammalian in type.

PIG 234.

Fed.

Dose: nearly whole of spleen (no T.B. seen).

Killed: May 25, 1908.

164 days.

P.M. — There was a miliary caseous nodule in the left submaxillary gland, and no tuberculosis elsewhere. *Culture from the submaxillary gland was avian.*

MONKEY 194.

Subcutaneous.

Dose: 4·0 cc. containing numerous T.B.

Died: February 2, 1908.

51 days.

P.M.—There was a cyst at the seat of inoculation and an ulcer in the overlying skin discharging purulent fluid. No tuberculosis elsewhere. *Culture from local lesion was avian.*

GUINEA-PIGS.

Material.	Number.	Duration of Life.	Result.	*Cultures.*
Emulsion of local lesion.	3011	D. 31 days	No T.	*None.*
	3012	D. 59 „	Local T.	*Avian.*

PIG 236.

Intravenous.

Dose: 5·0 cc. containing numerous T.B.

Died: April 11, 1908.

120 days.

P.M.—The lungs were congested and showed some reddish grey areas; they contained numerous translucent tubercles with calcareous centres. The mesenteric glands showed a fine yellow network. One submaxillary gland, one iliac, and one rectal gland were affected. T.B. were numerous in the spleen, scanty in the bone-marrow. *Cultures from spleen, mesenteric, and rectal glands were avian.*

GUINEA-PIGS.

Material.	Number.	Duration of Life.	Result.
Emulsion of lung.	3148	D. 45 days	Local T.
Emulsion of liver.	3149	D. 42 „	Local T.
Emulsion of mesenteric gland.	3150	K. 138 „	Local T. Two foci in bronchial glands from which avian culture was isolated.
Emulsion of rectal gland.	3151	D. 47 „	Local T. Three foci in spleen.

VIRUS A. V.

PASSAGE EXPERIMENT.

CULTURE.

The culture used (on July 4, 1906) was in the 4th generation, 22 days old. It was derived from the original material and had been in cultivation a total period of 88 days.

RABBIT 958.
Intravenous. 0·01 mg.
Died : 145 days
P.M.—Chronic general tuberculosis. Cultures from lung and kidney were avian in type.

GUINEA-PIG 2243.
Intraperitoneal.
Emulsion of kidney.
Killed : 55 days.
P.M.—Caseo-purulent nodule in the omentum and on the liver, from which avian cultures were obtained.

GUINEA-PIG 2242.
Intraperitoneal.
Emulsion of lung.
Killed : 55 days.
P.M.—Caseo-purulent nodule in the omentum, from which an avian culture was obtained.

RABBIT 1211.
Intraperitoneal.
Emulsion of omental nodule.
Died : 66 days.
P.M.—General tuberculosis. An avian culture was isolated from the lung.

GUINEA-PIG 2406.
Intraperitoneal.
Emulsion of kidney.
Killed : 69 days.
P.M.—Caseo-purulent nodules in omentum, from which an avian culture was isolated.

RABBIT 1362.
Intraperitoneal.
Emulsion of omental nodule.
Died : 127 days.
P.M.—Chronic general tuberculosis. An avian culture was isolated from a tuberculous joint.

GUINEA-PIG 2732.
Intraperitoneal.
Emulsion of pus from elbow-joint.
Killed : January 14, 1908.
96 days.
P.M.—Eight omental nodules ; a few tubercles on the peritoneum. Spleen enlarged ; foci in the liver ; focus in the kidney. Cultures from the omentum, spleen, and kidney had avian characters.

GUINEA-PIG 2407.
Intraperitoneal.
Emulsion of lung.
Killed : 69 days.
P.M.—Caseo-purulent nodules in omentum and bronchial gland, from which avian cultures were isolated.

RABBIT 1360.
Intrapulmonary.
Emulsion of omental nodule.
Killed : 141 days.
P.M.—Three caseating nodules in the lungs and one in the kidney. Avian cultures from both lung and kidney.

GUINEA-PIG 2408.
Intraperitoneal.
Emulsion of lung.
Killed : 69 days.
P.M.—Caseo-purulent nodules in omentum, from which an avian culture was isolated.

RABBIT 1361.
Intraperitoneal.
Emulsion of omental nodule.
Killed : 177 days.
P.M.—A few tubercles in omentum ; nodules on peritoneum. A tarsal joint was tuberculous. Avian cultures were obtained from omentum and a nodule on the testis.

GUINEA-PIG 2923.
Intraperitoneal.
Emulsion of nodule on testis.
Killed : January 14, 1908.
46 days.
P.M.—There were only two small nodules in the omentum, from which an avian culture was obtained.

GUINEA-PIG 2924.
Intraperitoneal.
Emulsion of nodule on testis
Died : 137 days.
P.M.—Purulent nodule on liver.

RABBIT 1740.
Intravenous.
Emulsion of liver nodule.
Killed : August 6, 1908.
114 days.
P.M.—Three soft yellow gritty nodules in spleen. Grey tubercle in kidney. No tuberculosis elsewhere. Avian cultures isolated from spleen and kidney.

GUINEA-PIG 3317.
Intraperitoneal.
Emulsion of kidney.
Killed : 91 days.
P.M.—No tuberculosis.

GUINEA-PIG 3316.
Subcutaneous.
Emulsion of spleen.
Killed : November 6, 1908.
91 days.
P.M.—Purulent nodule in inguinal gland only.

VIRUS P. XXI.

PASSAGE EXPERIMENT.

CULTURE.

The culture used (on May 22, 1906) was in the 8th generation, 21 days old. It was derived from the original material and had been in cultivation a total period of 169 days.

RABBIT 878.
Subcutaneous.
Dose : 1·0 mg.
Died : 155 days.

P.M.—General tuberculosis. An avian culture was isolated from a tuberculous joint.

CULTURE.
Derived from the elbow-joint.

2nd generation, 24 days old, used on December 21, 1906.

RABBIT 1165.
Intrapulmonary.
Died : 21 days.

P.M.—Acute tuberculosis.

RABBIT 1189.
Intrapulmonary.
Emulsion of sternal gland.
Killed : 94 days

P.M.—Two grey tubercles in the omentum and one on the diaphragm. An avian culture was derived from the omentum.

GUINEA-PIGS.
Inoculated intraperitoneally.
Killed : January 16, 1907.
83 days.

Material Inoculated.	Number.	Result.
E. of lung.	2175	Focus in a rib only. Local T.
E. of liver.	2174	
E. of kidneys.	2173	No T.

An avian culture was obtained from the focus in the rib of G.P. 2175.

RABBIT 876.
Subcutaneous.
Dose : 50·0 mg.
Died : 163 days.

P.M.—Chronic general tuberculosis. From the lung and a joint avian cultures were isolated.

CULTURE.
Derived from the lung.

2nd generation, 24 days old, used on December 21, 1906.

RABBIT 1164.
Intrapulmonary.
Died : 99 days.

P.M.—Kidneys and lungs chiefly affected. Avian culture isolated from the kidney.

GUINEA-PIG 2411.
Intraperitoneal.
Dose : 2·0 cc. of emulsion of lung.
Died : 39 days.

P.M.—Purulent nodules in the omentum. Opaque foci in the pyloric, lumbar, portal, and manubrial glands. Grey foci in liver and lungs. An avian culture was isolated from a portal gland.

RABBIT 1329.
Intrapulmonary.
Emulsion of omentum, liver and spleen.
Died : 115 days.

P.M.—Chronic general tuberculosis. Most severe in lungs, kidneys and joints. Avian cultures were obtained from the lung and ankle-joint.

RABBIT 1433.
Intrapulmonary.
Emulsion of lung.
Died : 102 days.

P.M.—Chronic general tuberculosis. Numerous limb joints affected.

RABBIT 1596.
Intraperitoneal.
Emulsion of lung.
Killed : May 14, 1908. 155 days.

P.M.—Animal fat. The glandular tissue in the wall of the dilated ileum and the terminal portion of the caecum contained collections of soft yellow substance in which moderately numerous tubercle bacilli were demonstrated. There were also a few transparent tubercles in the omentum (T.B.). No tuberculosis elsewhere.

GUINEA-PIG 2606.
Intraperitoneal.
Emulsion of lung.

P.M.—Soft miliary tubercle in each lung and two grey foci. Opaque focus in a bronchial gland. No tuberculosis elsewhere.

GUINEA-PIG 3314.
Subcutaneous.
Emulsion of lung.
Killed : 91 days.

P.M.—No tuberculosis.

GUINEA-PIG 3315.
Intraperitoneal.
Emulsion of lung.
Killed : November 6, 1908. 91 days.

P.M.—Caseo-purulent nodules in omentum, on diaphragm and liver. Cultures from the liver and omental nodules had the characters of avian tubercle bacilli.

LISTS OF ANIMALS, INOCULATED WITH AVIAN TUBERCLE BACILLI, FROM WHICH CULTURES WERE RECOVERED.

A.

ANIMALS AFTER PASSAGE THROUGH WHICH THE CHARACTERS OF THE TUBERCLE BACILLI INOCULATED REMAINED UNCHANGED.

Number of Animal.	Virus.	Date of Inoculation.	Material Inoculated.	Duration of Life.	Source of Cultures Investigated.
Horse 14	P. III.	January 9, 1907	Culture from original material.	138 days	Colic gland. Mesenteric gland.
Calf 432	A. II.	May 22, 1906	„	101 „	Bronchial, mediastinal and prescapular glands.
„ 520	A. III.	February 6, 1907	„	122 „	Mesenteric gland (three cultures.) Local lesion. Prescapular gland.
„ 494	A. IV.	January 29, 1907	„	154 „	Left local lesion. Right local lesion. Left prescapular gland (two cultures). Right prescapular gland (three cultures). Muscle nodule.
„ 568	„	November 9, 1907	Culture from prescapular gland of Calf 494.	181 „	Local lesion. Prescapular gland.
„ 458	A. V.	July 4, 1906	Culture from original material.	103 „	Prescapular gland.
„ 524	A. VIII.	May 28, 1907	„	30 „	Lung.
„ 544	„	May 28, 1907	„	33 „	Lung.
„ 550	A. X.	July 9, 1907	Emulsion of spleen of Calf 548.	36 „	Liver.
„ 560	„	August 14, 1907	Emulsion of liver of Calf 554.	40 „	Lung and liver.
„ 558	„	September 16, 1907.	Emulsion of liver of Calf 562.	45 „	Liver. Portal and bronchial glands.
„ 564	„	September 23, 1907.	Emulsion of liver of Calf 560.	45 „	Liver and mediastinal gland.
„ 566	„	October 31, 1907	Emulsion of liver of Calf 558.	43 „	Liver. Ileo-colic, mesenteric, and portal glands.
„ 572	„	December 9, 1907	Emulsion of liver of Calf 570.	163 „	Prescapular gland and suprarenal.
„ 576	„	December 9, 1907	„	163 „	Prescapular gland. Inferior cervical gland. Mesenteric gland.
„ 368	P. II.	February 6, 1906	Culture from original material	127 „	Contents of capsule.
„ 424	„	May 22, 1906	„	100 „	Prescapular gland and intestine.
„ 318	P. III.	September 7, 1905	„	95 „	Prescapular gland. Mesenteric gland. Marrow and blood.
„ 282	„	June 17, 1905	„	17 „	Spleen and blood.
„ 530	„	April 25, 1907	„	168 „	Local lesion.
„ 412	P. XXI.	May 22, 1906	„	99 „	Lung. Liver. Intestine. Prepectoral, bronchial, mediastinal, and mesenteric glands.
„ 492	P. XXVII.	January 7, 4907	„	172 „	Local lesion.
„ 490	P. XLIV.	January 4, 1907	„	122 „	Local lesion. Prescapular gland (two cultures). Mesenteric gland (two cultures).
Goat 38	A. II.	March 1, 1907	Culture from original material.	110 „	Mesenteric and coeliac glands.
„ 40	A. III.	February 6, 1907	„	128 „	Left local lesion. Right local lesion. Left prescapular gland. Mesenteric gland. Lung and kidney.
„ 54	A. VII.	January 24, 1908	„	119 „	Local lesion. Prescapular, cervical, and mesenteric glands.
„ 42	A. X.	July 9, 1907	„	98 „	Local lesion. Prescapular and mesenteric glands.
„ 44	„	July 9, 1907	„	154 „	Prescapular gland and lung.
„ 48	„	July 9, 1907	„	83 „	Prescapular gland. Liver and mesenteric gland.
Pig 104	P. II.	May 4, 1905	„	69 „	Coeliac gland.
„ 110	„	August 12, 1905	„	159 „	Mesenteric gland.
„ 136	„	March 24, 1906	Culture from mesenteric gland of Pig. 110.	142 „	Inguinal gland.

LISTS OF ANIMALS, INOCULATED WITH AVIAN TUBERCLE BACILLI, FROM WHICH CULTURES WERE RECOVERED—*continued.*

Number of Animal.	Virus.	Date of Inoculation.	Material Inoculated.	Duration of Life.	Source of Cultures Investigated.
Pig 178	A. VII.	March 12, 1907	Culture from original material.	101 days	Liver, portal, and mesenteric glands.
,, 180	,,	March 12, 1907	,,	105 ,,	Liver. Lung. Inguinal and mesenteric glands.
,, 182	,,	March 12, 1907	,,	106 ,,	Liver, spleen, and mesenteric gland.
,, 246	,,	March 11, 1908	Organs of Rabbit 1603	93 ,,	Mesenteric gland.
,, 200	A. X.	July 9, 1907	Culture from original material.	126 ,,	Mesenteric gland.
,, 196	,,	July 9, 1907	,,	142 ,,	Mesenteric gland.
,, 198	,,	July 9, 1907	,,	111 ,,	Mesenteric gland.
,, 234	,,	December 13, 1907.	Spleen of Calf 566	164 ,,	Submaxillary gland.
,, 236	,,	December 13, 1907.	Mesenteric gland of Calf 566.	120 ,,	Spleen. Mesenteric and rectal glands.
Monkey 158	A. I.	November 22, 1906.	Culture from original material.	63 ,,	Local lesion.
,, 162	,,	November 22, 1906.	,,	144 ,,	Lung.
,, 192	A. X.	December 9, 1907	Liver of Calf 570	55 ,,	Local lesion.
,, 194	,,	December 13, 1907.	Mediastinal gland of Calf 566.	51 ,,	Local lesion.
,, 196	,,	November 27, 1907.	Culture from original material.	29 ,,	Liver and spleen.
,, 122	P. II.	November 30, 1905.	,,	112 ,,	Mesenteric gland.
,, 124	,,	November 30, 1905.	,,	113 ,,	Mesenteric gland.
,, 134	P. III.	April 12, 1906	,,	131 ,,	Caecum.
,, 154	P. XXI.	November 22, 1906.	,,	34 ,,	Liver.
Cat 96	A. VII.	March 12, 1907	Culture from original material.	69 ,,	Omentum.
,, 62	P. II.	September 25, 1905.	,,	73 ,,	Spleen, sternal gland.
,, 64	,,	September 25, 1905.	,,	134 ,,	Local lesion and lung.
Dog 164	A. X.	July 9, 1907	,,	142 ,,	Lung, liver, spleen, and kidney.
Rat 123	A. VII.	March 12, 1907	,,	574 ,,	Spleen and liver.
,, 133	A. VIII.	May 28, 1907	,,	497 ,,	Spleen and omentum.
,, 85	P. II.	September 25, 1905.	,,	184 ,,	Spleen.
,, 79	P. III.	September 7, 1905.	,,	219 ,,	Liver.
Mouse 86	A. IV.	November 8, 1907	Culture from prescapular gland of Calf 494.	333 ,,	Spleen.
,, 76	A. X.	September 23, 1907.	Liver of Calf 560	379 ,,	Spleen.
,, 99	,,	November 27, 1907.	Culture from original material.	350 ,,	Spleen and liver.
Rabbit 1088	A. I.	November 22, 1906.	,,	86 ,,	Lung. (Spleen and kidney—pseudo tuberculous.)
,, 1089	,,	November 22, 1906.	,,	179 ,,	Lung.
,, 884	A. II.	May 22, 1906	,,	143 ,,	Lung. Kidney.
,, 1260	,,	March 1, 1907	,,	81 ,,	Lung.
,, 988	A. III.	July 14, 1906	,,	157 ,,	Kidney.
,, 989	,,	July 14, 1906	,,	93 ,,	Axillary glands.
,, 1238	,,	February 6, 1907	,,	464 ,,	Appendix.
,, 964	A. IV.	July 4, 1906	,,	171 ,,	Knee joint.
,, 818	A. V.	April 7, 1906	Emulsion of original material.	109 ,,	Inguinal gland.
,, 957	,,	July 4, 1906	Culture from original material.	168 ,,	Lung. Kidney.
,, 958	,,	July 4, 1906	,,	145 ,,	Lung. Kidney.
,, 960	,,	July 4, 1906	,,	198 ,,	Ankle and knee joints.
,, 1211	,,	January 21, 1907	Omentum of Guinea-pig 2243.	55 ,,	Lung.
,, 1360	,,	June 5, 1907	Omentum of Guinea-pig 2407.	141 ,,	Lung. Kidney.
,, 1361	,,	June 5, 1907	Omentum of Guinea-pig 2408.	177 ,,	Omentum. Testis.

LISTS OF ANIMALS, INOCULATED WITH AVIAN TUBERCLE BACILLI, FROM WHICH CULTURES WERE RECOVERED—*continued.*

Number of Animal.	Virus.	Date of Inoculation.	Material Inoculated.	Duration of Life.	Source of Cultures Investigated.
Rabbit 1362	A. V.	June 5, 1907	Omentum of Guinea-pig 2406.	127 days	Elbow joint.
„ 1740	„	April 14, 1908	Emulsion of liver nodule of Guinea-pig 2942.	114 „	Spleen and kidney.
„ 1486	A. VI.	September 21, 1907.	Culture from original material.	85 „	Kidney.
„ 1349	A. VIII.	May 28, 1907	„	258 „	Kidney.
„ 1387	A. X.	July 9, 1907	„	26 „	Liver nodule.
„ 1597	„	December 13, 1907	Emulsion of liver of Calf 566.	343 „	Scapular gland.
„ 578	P. II.	December 7, 1905	Sternal gland of Cat 62	19 „	Spleen.
„ 677	„	January 18, 1906	Mesenteric gland of Pig 110.	106 „	Lung. Inguinal gland.
„ 740	„	February 8, 1906	Culture from original material.	56 „	Kidney.
„ 882	„	May 22, 1906	„	198 „	Wrist joint.
„ 883	„	May 22, 1906	„	129 „	Lung.
„ 947	„	July 3, 1906	„	156 „	Axillary gland.
„ 876	P. XXI.	May 22, 1906	„	163 „	Lung. Elbow joint.
„ 878	„	May 22, 1906	Culture from original material.	155 „	Elbow joint.
„ 821	„	May 22, 1906	„	139 „	Spleen. Skin tissue.
„ 1164	„	December 21, 1906.	Culture from lung of Rabbit 876.	99 „	Kidney.
„ 1189	„	January 11, 1907	Sternal gland of Rabbit 1165.	94 „	Omentum.
„ 1329	„	May 8, 1907	Organs of Guinea-pig 2411.	115 „	Lung. Ankle joint.
„ 1180	P. XLIV.	January 4, 1907	Culture from original material.	323 „	Lung.
G.P. 1975	A. I.	March 28, 1906	Emulsion of original material.	229 „	Portal and sternal glands. Ligament.
„ 2261	A. II.	December 11, 1906.	Spleen of Monkey 160	49 „	Local lesion. Axillary gland.
„ 2143	A. III.	July 14, 1906	Culture from original material.	184 „	Skin, No. I. Skin, No. II.
„ 2145	„	July 14, 1906	„	184 „	Sternal gland.
„ 2146	„	July 14, 1906	„	184 „	Omentum.
„ 2514	„	June 8, 1907	Prescapular gland of Calf 520.	107 „	Omentum.
„ 2515	„	June 8, 1906	„	107 „	Omentum.
„ 2516	„	June 14, 1907	Prescapular gland of Goat 40.	153 „	Omentum.
„ 2518	„	June 14, 1907	Local lesion of Goat 40	118 „	Omentum.
„ 2521	„	June 14, 1907	Lung of Goat 40	153 „	Omentum.
„ 2131	A. IV.	July 4, 1906	Culture from original material.	180 „	Liver. Spleen. Omentum. Joint and lumbar gland.
„ 2356	„	January 29, 1907	„	80 „	Lung. Inguinal gland.
„ 2545	„	July 2, 1907	Right prescapular gland of Calf 494.	153 „	Lung.
„ 2547	„	July 2, 1907	Left prescapular gland of Calf 494.	153 „	Omentum.
„ 2549	„	July 2, 1907	Left local lesion of Calf 494.	153 „	Omentum. Peritoneum nodule.
„ 2904	„	November 8, 1907	Culture from prescapular gland of Calf 494.	120 „	Scapular gland.
„ 3169	„	May 8, 1908	Prescapular gland of Calf 568.	113 „	Inguinal gland.
„ 1962	A. V.	April 7, 1906	Emulsion of original material.	109 „	Lung.
„ 2153	„	August 15, 1906	Contents of capsule from Guinea-pig 2066.	79 „	Local lesion.
„ 2242	„	November 27, 1906.	Lung of Rabbit 958	55 „	Omentum.
„ 2243	„	November 27, 1906.	Kidney of Rabbit 958	55 „	Liver ligament. Liver nodule. Omental nodule.
„ 2406	„	March 28, 1907	Kidney of Rabbit 1211	69 „	Omentum.
„ 2407	„	March 28, 1907	Lung of Rabbit 1211	69 „	Omentum. Bronchial gland.
„ 2408	„	March 28, 1907	„	69 „	Omentum.
„ 2605	„	August 27, 1907	Contents of capsule of Guinea-pig 2396.	17 „	Sternal gland.

LISTS OF ANIMALS, INOCULATED WITH AVIAN TUBERCLE BACILLI, FROM WHICH CULTURES WERE RECOVERED—*continued*.

Number of Animal.	Virus.	Date of Inoculation.	Material Inoculated.	Duration of Life.	Source of Cultures Investigated.
G.P. 2619	A. V.	September 1, 1907.	Spleen of Guinea-pig 2605.	62 days	Omentum.
„ 2732	„	October 10, 1907	Elbow joint of Rabbit 1362.	96 „	Omentum. Spleen and kidney.
„ 2923	„	November 29, 1907.	Testis of Rabbit 1361	46 „	Omentum.
„ 2534	A. VII.	June 25, 1907	Lung of Pig 180	153 „	Spleen.
„ 3189	„	May 22, 1908	Prescapular gland of Goat 54.	103 „	Inguinal gland.
„ 3190	„	May 22, 1908	Local lesion of Goat 54	103 „	Inguinal gland.
„ 3197	„	June 12, 1908	Mesenteric gland of Pig 246.	103 „	Inguinal gland.
„ 3198	„	June 12, 1908	„	103 „	Omentum.
„ 2503	A. VIII.	May 28, 1907	Culture from original material.	52 „	Spleen.
„ 2509	„	June 6, 1907	Organs of Guinea-pig 2506.	56 „	Omentum.
„ 2589	A. X.	August 13, 1907	Liver of Calf 554	37 „	Spleen.
„ 2594	„	August 14, 1907	Spleen of Calf 550	44 „	Spleen.
„ 2626	„	September 23, 1907.	Liver of Calf 560	49 „	Spleen. Omentum.
„ 2869	„	October 31, 1907	Portal gland of Calf 558	127 „	Omentum.
„ 2870	„	October 31, 1907	„	62 „	Local lesion.
„ 2900	„	November 7, 1907.	Liver of Calf 564	55 „	Sternal gland.
„ 2905	„	November 11, 1907.	Spleen of Guinea-pig 2626.	143 „	Omental nodule.
„ 2944	„	December 9, 1907	Liver of Calf 570	28 „	Local lesion.
„ 3012	„	February 3, 1908	Local lesion of Monkey 194.	59 „	Inguinal gland.
„ 2561	„	July 9, 1907	Lung of Calf 548	185 „	Local lesion. Right inguinal gland. Left inguinal gland.
„ 3150	„	April 13, 1908	Mesenteric gland of Pig 236.	138 „	Bronchial gland.
„ 3173	„	May 20, 1908	Prescapular gland of Calf 572.	105 „	Inguinal gland.
„ 3177	„	May 20, 1908	„	105 „	Omentum.
„ 3174	„	May 20, 1908	„	105 „	Omentum.
„ 3175	„	May 20, 1908	„	105 „	Inguinal gland.
„ 3178	„	May 20, 1908	Prescapular gland of Calf 576.	105 „	Inguinal gland.
„ 3179	„	May 20, 1908	„	105 „	Peritoneal nodule.
„ 3181	„	May 20, 1908	„	105 „	Inguinal gland.
„ 3306	„	August 1, 1908	Culture from prescapular gland of Calf 574.	96 „	Lung nodules.
„ 3307	„	August 1, 1908	„	96 „	Inguinal gland.
„ 1494	P. II.	April 4, 1905	Culture from original material.	37 „	Blood.
„ 1859	„	January 18, 1906	Mesenteric gland of Pig 110.	41 „	Inguinal gland.
„ 1860	„	January 18, 1906	„	41 „	Bronchial gland and peritoneal nodule.
„ 1613	P. III.	July 4, 1905	Spleen of Calf 282	133 „	Peritoneal nodule.
„ 1901	„	February 9, 1906	Culture from Guinea-pig 1613.	34 „	Inguinal, iliac, and bronchial glands.
„ 1922	„	March 2, 1906	Culture from spleen of Calf 282.	104 „	Inguinal gland.
„ 3203	„	June 15, 1908	Emulsion of colic gland of Pony 14.	100 „	Omental nodule.
„ 1789	P. XXI.	December 5, 1905	Emulsion of original material.	41 „	Omental nodule.
„ 2175	„	October 25, 1906	Lung of Rabbit 878	83 „	Rib.
„ 2409	„	March 30, 1907	Lung of Rabbit 1164	43 „	Omentum.
„ 2411	„	March 30, 1907	„	39 „	Portal gland.
„ 2606	„	August 31, 1907	Emulsion of lung of Rabbit 1329.	341 „	Lung.
„ 3205	„	June 17, 1908	Culture from Guinea-pig 2177.	98 „	Subcutaneous nodule.
„ 3315	„	August 7, 1908	Emulsion of lung of Guinea-pig 2606.	91 „	Liver and omental nodule.

LISTS OF ANIMALS, INOCULATED WITH AVIAN TUBERCLE BACILLI, FROM WHICH CULTURES WERE RECOVERED—*continued.*

Number of Animal.	Virus.	Date of Inoculation.	Material Inoculated.	Duration of Life.	Source of Cultures Investigated.
G.P. 1799	P. XXVII.	December 12, 1905.	Emulsion of original material.	30 days	Subcutaneous nodule.
„ 1913	„	February 22, 1906.	Culture from original material.	113 „	Inguinal gland.
„ 2537	„	June 28, 1907	Local lesion of Calf 492	150 „	Omentum.
„ 2490	P. XLII.	May 16, 1907	Culture from original material.	80 „	Sternal gland.
„ 2281	P. XLIV.	January 4, 1907	„	152 „	Inguinal gland.

B.

ANIMALS FROM EACH OF WHICH A TYPE OF BACILLUS WAS RECOVERED DIFFERENT FROM THAT INOCULATED.

Number of Animal.	Virus.	Date of Inoculation.	Material Inoculated.	Duration of Life.	Source and Description of Cultures Investigated.
Calf 456	A. IV.	July 4, 1906	Culture from original material.	108 days	From the prescapular gland a culture was isolated which resembled a bovine tubercle bacillus in cultural characters (Class I.) and in virulence for rabbits and guinea-pigs.
„ 390	P. XXVII.	February 22, 1906	„	90 „	Cultures from the suprarenal body, the prepectoral and portal glands were avian in characters. A culture from the lung resembled a bovine tubercle bacillus, and that from a bronchial gland contained both avian and bovine tubercle bacilli.
„ 574	A. X.	December 13, 1907.	Emulsion of liver of Calf 566.	109 „	A culture was isolated from the prescapular gland which was avian in characters and virulence. A culture from a lesion in the bronchial gland resembled a bovine tubercle bacillus both in characters and virulence.
Goat 36	P. II.	February 8, 1906	Culture from original material.	131 „	From a lung nodule a culture was isolated which was mammalian in characters, growing like a bovine tubercle bacillus of Class III.
Monkey 118	„	November 30, 1905.	„	98 „	This animal died of general tuberculosis, and from the lungs and spleen cultures of mammalian tubercle bacilli were isolated which were virulent for guinea-pigs and rabbits. A culture direct from the local lesion was avian in type. A guinea-pig was inoculated from the local lesion and died of G.T.; the culture from it was mammalian.
Rabbit 777	P. XXVII.	February 22, 1906.	„	91 „	This animal showed a cystic local lesion, grey miliary tubercles on the surface of the liver and a caseous patch in the lung. A culture of bovine tubercle bacilli was isolated from the lung nodule.
G.P. 1612	P. III.	July 4, 1905	Spleen of Calf 282	150 „	A culture from the bronchial gland grew luxuriantly like an easy-growing human tubercle bacillus, and was virulent for guinea-pigs and slightly virulent for the rabbit and calf.
„ 1857	P. II.	January 15, 1906	Inguinal gland of Pig 106.	119 „	This animal developed general tuberculosis, and a culture from the bronchial gland grew like a bovine tubercle bacillus of Class II. An emulsion of bronchial gland caused general tuberculosis in a second guinea-pig.

LIST OF ANIMALS, INOCULATED WITH AVIAN TUBERCLE BACILLI, FROM WHICH CULTURES COULD NOT BE RECOVERED.

Number of Animal.	Virus.	Date of Inoculation.	Material Inoculated.	Duration of Life.	Tissues from which Culture Tubes were sown.
Pig 106	P. II.	June 14, 1905	Culture from original material.	215 days	Inguinal gland.
Monkey 120	„	November 30, 1905	„	113 „	Lung tubercle. Lung cavity.
G.P. 2036	„	May 22, 1906	„	198 „	Left and right inguinal glands.
„ 2576	„	July 16, 1907	„	193 „	Inguinal gland.
„ 2536	P. XXVII.	June 28, 1907	Emulsion of local lesion of Calf 492.	150 „	Omentum.
„ 2283	P. XLIV.	January 4, 1907	Culture from original material.	152 „	Left and right inguinal glands.
„ 2472	„	May 6, 1907	Emulsion of local tumour of Calf 490.	75 „	Omentum nodule. Diaphragm nodule.
Pony 2	A. VIII.	August 15, 1907	Culture from original material.	158 „	Prescapular glands I and II. Lung nodule.
„ 4	„	August 15, 1907	„	160 „	Liver substance. Liver nodule.
Pig 176	A. VII.	March 12, 1907	„	315 „	Omentum. Iliac, submaxillary and mesenteric glands. Guinea-pigs inoculated from the tissues remained healthy.
G.P. 1974	A. I.	April 26, 1906	„	229 „	Inguinal, bronchial, sternal and portal glands.
„ 2144	A. III.	July 14, 1906	„	184 „	Skin and ileo-colic gland.
„ 2146	„	July 14, 1906	„	184 „	Omentum.
„ 2512	„	June 8, 1907	Emulsion of local lesion of Calf 520.	107 „	Omentum.
„ 2513	„	June 8, 1907	„	107 „	Omentum.
„ 2520	„	June 14, 1907	Emulsion of mesenteric gland of Goat 40.	153 „	Omentum.
„ 3169	A. IV.	May 8, 1908	Emulsion of prescapular gland of Calf 568.	113 „	Inguinal gland.
„ 2037	A. V.	May 22, 1906	Culture from original material.	198 „	Inguinal gland.
„ 2127	„	July 4, 1906	„	183 „	Sternal gland. Omental nodules.
„ 2125	„	July 4, 1906	„	127 „	Portal gland.
„ 2623	A. VI.	September 21, 1907	„	171 „	Scapular gland. Lung. Liver. Kidney.
„ 2532	A. VII.	June 25, 1907	Emulsion of mesenteric gland of Pig 180.	153 „	Inguinal gland.
„ 2533	„	June 25, 1907	Emulsion or liver of Pig 180.	153 „	Omentum.
„ 2535	„	June 25, 1907	Emulsion of inguinal gland of Pig 180.	153 „	Inguinal gland.
„ 3190	„	May 22, 1908	Emulsion of local lesion of Goat 54.	103 „	Inguinal gland.
„ 3197	„	June 12, 1908	Emulsion of mesenteric gland of Pig 246.	103 „	Inguinal gland.
„ 2541	A. VIII.	July 1, 1907	Emulsion of lung of Calf 544.	154 „	Sternal gland. Omentum.
„ 2597	„	August 15, 1907	Culture from original material.	163 „	Local lesion. Axillary gland.
„ 2595	„	August 15, 1907	„	163 „	Axillary gland.
„ 2542	A. X.	July 1, 1907	Emulsion of lung of Calf 546.	158 „	Inguinal gland.
„ 2543	„	July 1, 1907	Emulsion of liver of Calf 546.	158 „	Inguinal gland.
„ 2555	„	July 9, 1907	Culture from original material.	202 „	Sternal gland. Omentum.
„ 2558	„	July 9, 1907	Emulsion of spleen of Calf 548.	185 „	Right and left inguinal glands.
„ 2559	„	July 9, 1907	„	185 „	Right and left inguinal glands.
„ 2898	„	November 7, 1907	Emulsion of liver of Calf 564.	122 „	Scapular gland.
„ 2918	„	November 27, 1907	Culture from original material.	99 „	Inguinal gland.

EXPERIMENTS ON FOWLS AND PIGEONS WITH COLLODION CAPSULES CONTAINING MAMMALIAN TUBERCLE BACILLI.

Number of Virus.	Source of Culture.	Age and Generation of Culture.	Number of Animal.	Date of Insertion.	Duration of Experiment.	Result.
B. IV. ...	G.P. 1407.	2 days, 6th generation.	Fowl 14	January 24, 1906	121 days	Capsule surrounded by vascular fibrous membrane; collodion contracted and ruptured. Culture was deposited on the glass. The culture was grown and was unchanged. Guinea-pig 2048 inoculated with the contents of capsule died of G.T.
"	Capsule from Fowl 14.	16 days, 2nd generation.	Fowl 64	June 28, 1906	125 "	Capsule intact and filled with fluid; no apparent increase of culture. The culture was grown and was unchanged. Fowl 122 was inoculated intravenously with contents of capsule; when killed after 83 days it was healthy except for a nodule at seat of inoculation from which an unchanged culture was isolated.
"	"	10 days, 2nd generation.	Fowl 74	July 17, 1906	125 "	Capsule surrounded by thin fibrous tissue; it was ruptured but contained a little clear fluid. The culture was grown and was unchanged.
"	Capsule from Fowl 64.	29 days, 5th generation.	Pigeon 64	June 13, 1907	177 "	Capsule intact and filled with clear fluid and a little deposit. The culture was grown and its characters were unchanged. Guinea-pig 3230 inoculated with culture died of G.T. Fowl 394 inoculated intra-muscularly developed after 94 days a local lesion only, from which a mammalian culture was isolated.
"	Capsule from Fowl 14.	10 days, 2nd generation.	Fowl 76	July 18, 1906	124 "	Capsule found free; collodion ruptured. No increase of culture. No growth was obtained.
"	Capsule from Fowl 64.	24 days, 3rd generation.	Pigeon 36	January 11, 1907	105 "	Capsule intact. No growth of culture was obtained.
"	Capsule from Fowl 74.	24 days, 3rd generation.	Pigeon 24	January 11, 1907	102 "	Capsule intact. No growth of culture was obtained. Guinea-pig 2441 inoculated with the contents of capsule remained healthy.
"	"	24 days, 3rd generation.	Pigeon 26	January 11, 1907	105 "	Capsule intact. No growth of culture was obtained.
B. V. ...	G.P. 711.	17 days, 17th generation.	Fowl 10	November 25, 1905	79 "	Capsule surrounded by fibrous tissue; collodion separated from the glass which contained turbid fluid. The culture was grown and was unchanged.
"	Capsule from Fowl 10.	19 days, 6th generation.	Fowl 90	August 7, 1906	70 "	Capsule intact and almost filled with fluid and flocculi of growth. The culture was grown and was unchanged. Fowls 114 and 116 inoculated intravenously with the capsule contents remained healthy.
"	Capsule from Fowl 90.	29 days, 5th generation.	Pigeon 68	June 13, 1907	177 "	Capsule intact and filled with clear fluid; clumps of tubercle bacilli at the bottom. The culture was grown and was unchanged in characters. Guinea-pig 3233 inoculated with the culture died of G.T. Fowl 400 inoculated intra-muscularly developed local lesion and two tubercles in the liver; the culture from local lesion was mammalian.
"	"	29 days, 5th generation.	Pigeon 70	June 13, 1907	177 "	Capsule filled with clear fluid; no increase of culture. The culture was grown and was unchanged in characters.
"	Capsule from Fowl 10.	32 days, 2nd generation.	Fowl 42	April 11, 1906	99 "	Capsule surrounded by fibrous tissue; collodion cracked. The wound had been pecked open and the capsule had become contaminated. Guinea-pigs 2149 and 2150 were inoculated with the contents of the capsule and were healthy when killed.
"	Capsule from Fowl 90.	Primary culture	Pigeon 16	November 9, 1906	134 "	The culture in the capsule was contaminated. Fowl 226 inoculated intra-peritoneally was killed after 76 days, and showed on the mesentery a moderate number of grey nodules with yellow foci; there was no disease elsewhere.
"	"	13 days, 2nd generation.	Pigeon 22	November 9, 1906	139 "	The capsule was intact. There was no increase in the culture. No growth of culture was obtained. Fowl 228 inoculated intraperitoneally with contents of capsule was killed after 71 days and found healthy.
"	"	13 days, 2nd generation.	Pigeon 18	November 9, 1906	159 "	Capsule intact and half filled with slightly turbid fluid. No growth of culture was obtained. Guinea-pig 2425 inoculated with contents of capsule remained healthy.

B. XXII.	Dog 72 (lung)	4 days, 5th generation.	Fowl **62**	June 22, 1906	131 ,,	Capsule intact, and almost entirely filled with clear fluid and whitish flocculi. The culture was grown and was unchanged. Fowl 120 was inoculated intravenously with contents of capsule. It died in 51 days; the organs appeared normal, but contained a few T.B.
,,	Capsule from Fowl 62.	24 days, 3rd generation.	Pigeon **28**	January 11, 1907	102 ,,	The capsule was intact. No growth of culture was obtained. Guinea-pig 2442 inoculated with the contents of capsule remained healthy.
B. XXVI.	Original material	14 days, 5th generation.	Fowl **6**	November 23, 1905	82 ,,	Capsule enclosed in fibrous tissue; the collodion had separated from the glass. It contained a mucinous fluid with cells and a few T.B. The culture was grown and was unchanged.
P. XII.	G.P. 1636		Fowl **56**	May 18, 1906	55 ,,	The culture was recovered and was unchanged.
,,	Capsule from Fowl 56.	35 days, 2nd generation.	Pigeon **14**	September 13, 1906	155 ,,	Capsule intact and almost full of fluid with scattered whitish flocculi. The culture was recovered and was unchanged. Fowl 208 was inoculated with the contents of capsule, and when killed after 52 days was healthy.
E. II.	Original material	62 days, 13th generation.	Pigeon **10**	September 11, 1906	155 ,,	Capsule intact, and two-thirds filled with fluid and a deposit of culture. The culture was recovered, and was unchanged in characters
,,	Capsule from Pigeon 10.	47 days, 4th generation.	Pigeon **60**	June 10, 1907	179 ,,	Capsule intact and quite filled with a clear fluid; the collodion was lined by a deposit of whitish substance (T.B.). The culture was recovered and was unchanged. Guinea-pig 3231 was inoculated with the culture from the capsule, and died of G.T. Fowl 396 inoculated intra-muscularly developed a local lesion only from which a mammalian culture was recovered.
,,	,,	47 days, 4th generation.	Pigeon **62**	June 10, 1907	179 ,,	Capsule intact and quite filled with a clear fluid; on the collodion was a deposit of culture. The culture was recovered and was unchanged. Guinea-pig 3232 was inoculated with the culture grown from capsule and died of G.T. Fowl 398 inoculated intra-muscularly developed a local lesion and showed a few foci in the liver after 94 days; the culture from the local lesion was mammalian.
,,	Capsule from Pigeon 62.	6 days, 3rd generation.	Fowl **368**	March 6, 1908	122 ,,	Collodion contracted and dry but capsule apparently intact The culture was recovered and was unchanged in characters.
E. IV.	Original material	7 days, 12th generation.	Fowl **78**	July 18, 1906	134 ,,	Capsule intact and surrounded by a fibrous envelope; it contained a little fluid and granules of culture. The culture was recovered and was unchanged.
,,	,,	30 days, 12th generation.	Pigeon **2**	August 10, 1906	164 ,,	Capsule intact: the collodion portion was crumpled and contained fluid with suspended flocculi. The culture was recovered and was unchanged in characters.
,,	,,	30 days, 12th generation.	Pigeon **4**	August 10, 1906	164 ,,	Capsule similar to the preceding. The culture was recovered and was unchanged.
,,	Capsule from Pigeon 4.	41 days, 4th generation.	Pigeon **56**	June 6, 1907	186 ,,	Capsule contracted: no increase of growth. The culture was recovered and was unchanged in characters.
,,	Capsule from Fowl 78.	24 days, 3rd generation.	Pigeon **38**	January 11, 1907	102 ,,	The capsule was intact. No growth was obtained. Guinea-pig 2444 inoculated with the contents of capsule remained healthy.
,,	,,	24 days, 3rd generation.	Pigeon **40**	January 11, 1907	102 ,,	The capsule was intact. No growth was obtained. Guinea-pig 2445 inoculated with the contents of the capsule remained healthy.
P. XLI.	Original material	43 days, 5th generation.	Pigeon **6**	September 10, 1906	155 ,,	Capsule intact and half filled with turbid fluid. At the glass end was a deposit of culture. No growth occurred on culture media. Fowl 206 inoculated intraperitoneally with the contents of capsule was healthy when killed after 70 days.
P. IV.	Original material	43 days, 15th generation.	Fowl **16**	January 24, 1906	122 ,,	Capsule ruptured but surrounded by a complete fibrous envelope: there was a little growth lining the interior. The post-mortem examination of the fowl showed a few caseous tubercles in the spleen and liver, and fairly numerous tubercles beneath the mucous membrane of the intestine. From the intestinal and liver nodules typical avian tubercle cultures were isolated. Fowl 226 inoculated intra-peritoneally with the contents of the capsule showed, after 76 days, a few yellowish foci only on the mesentery. Guinea-pig 2049 and Rabbit 888 inoculated with capsule contents remained healthy. The results show that the culture in the capsule was dead and the fowl was without doubt naturally infected.

EXPERIMENTS ON FOWLS AND PIGEONS WITH COLLODION CAPSULES—*continued.*

Number of Virus.	Source of Culture.	Age and Generation of Culture.	Number of Animal.	Date of Insertion.	Duration of Experiment.	Result.
P. IV. ...	Calf 350	9 days, 8th generation.	Fowl 86	July 28, 1906	124 days	Capsule intact and almost full of fluid with clumps of culture. No growth was obtained on culture media. Fowl 166 was inoculated intra-peritoneally with the contents of capsule. It was killed after 73 days and showed fairly severe peritoneal tuberculosis only. From the peritoneal nodules numerous culture tubes were sown but no growth resulted. The tubes were scraped and the scrapings were inoculated into a guinea-pig, which remained healthy. The peritoneal nodules were emulsified and inoculated into Fowl 204, which, after 65 days, showed scattered necrotic nodules on the mesentery. Culture tubes sown from these nodules gave no growth. Guinea-pig 2426 inoculated from the nodules showed after eight weeks four tubercles in omentum. (No T.B.)
„	„	9 days, 8th generation.	Fowl 88	July 28, 1906	124 „	Capsule intact and surrounded by a fibrous envelope. It was almost full of fluid and contained considerable culture. No growth, however, was obtained on culture media.
B. IX. ...	Calf 374	28 days, 3rd generation.	Fowl 60	June 19, 1906	137 „	Capsule quite free, intact, and about a quarter filled with fluid and greyish granules. No culture was obtained. Fowl 124 inoculated intravenously with contents of capsule, when killed after 80 days, was healthy.

EXPERIMENTS ON GUINEA-PIGS WITH COLLODION CAPSULES CONTAINING AVIAN TUBERCLE BACILLI.

A. II. ...	Calf 432 (prescapular gland).	157 days, 2nd generation.	G.P. 2397	March 21, 1907	253 days	The capsule had burst and was surrounded by a caseo-purulent mass; in the omentum there were six yellow pea-sized nodules. Organs healthy. The culture was recovered from the capsule and was unchanged in characters. Guinea-pigs 2927 and 2928 were inoculated intraperitoneally with contents of capsule. Guinea-pig 2928, killed after 152 days, was healthy. Guinea-pig 2927, killed after 167 days, showed an omental nodule only, from which no growth occurred on culture media.
„	Calf 432 (bronchial gland).	157 days. 2nd generation.	G.P. 2398	March 21, 1907	53 „	The capsule was intact. The culture was recovered and was unchanged.
A. V. ...	Original material	16 days, 3rd generation.	G.P. 2066	June 2, 1906	73 „	The capsule was ruptured, and there was a yellow nodule in the omentum. The culture was recovered, and was unchanged. Guinea-pig 2153 was inoculated subcutaneously with the contents of capsule, and showed after 79 days a subcutaneous nodule only, from which an avian culture was isolated.
„	„	16 days, 3rd generation.	G.P. 2067	June 2, 1906	73 „	The capsule was intact; the culture was recovered and was unchanged. Guinea-pig 2154, inoculated subcutaneously with capsule contents, was healthy when killed after 79 days.
„	Capsule from G.P. 2066.	84 days, primary	G.P. 2181	November 6, 1906	129 „	The capsule was intact, and the culture recovered was unchanged. Guinea-pigs 3208 and 3209 were inoculated subcutaneously each with the culture from a glycerin serum tube, and when killed after 98 days showed local tuberculosis only.

,,	Capsule from G.P. 2066.	84 days, primary	G.P. **2182**	November 6, 1906	226 ,,	The culture was recovered from the capsule, and was unchanged. With the culture recovered from the contents of capsule two guinea-pigs, 3206 and 3207, were inoculated subcutaneously; they, when killed after 98 days showed local tuberculosis only, and from both avian cultures were isolated. Guinea-pig 2531, inoculated intraperitoneally with the contents of capsule, was killed after 120 days. There were several purulent nodules in omentum and on diaphragm; purulent foci in lumbar and sternal glands; slight enlargement of spleen. A culture made from an omental nodule grew two colonies, both of which were mammalian in type. With this culture two guinea-pigs were inoculated subcutaneously; both died of G.T. Two fowls were inoculated intravenously, and both developed caseous nodules in the spleen, liver, and lungs; one fowl, inoculated intramuscularly, showed a caseous nodule in the lung after 82 days.
,,	Capsule from G.P. 2181.	224 days, 2nd generation.	G.P. **2939**	December 6, 1907	140 ,,	The capsule was ruptured and was completely enclosed in a fibrous envelope. The culture was recovered from the capsule and was unchanged in character. Guinea-pigs 3158 and 3159 were inoculated subcutaneously with capsule contents. Guinea-pig 3159 died in 20 days and showed no tuberculosis. Guinea-pig 3158, killed after 127 days, showed purulent nodules in inguinal glands from which an avian culture was isolated. Guinea-pigs 3220 and 3221 were inoculated subcutaneously each with a serum tube of culture recovered from the capsule. When killed after 107 days one showed slight tuberculosis, the other local disease only. From Guinea-pig 3220 an avian culture was isolated.
,,	G.P. 2243 (liver nodule).	27 days, 2nd generation.	G.P. **2393**	March 21, 1907	170 ,,	The capsule was quite filled with turbid fluid and there was a yellowish deposit. There was a hole in the collodion and there was a nodule in the omentum and on the liver. The culture recovered from the capsule was unchanged in characters.
,,	G.P. 2243 (omentum).	27 days. 2nd generation.	G.P. **2395**	March 21, 1907	158 ,,	The capsule was quite filled with turbid fluid; there was a minute hole in the collodion and a single tubercle on peritoneum. The culture recovered from the capsule was unchanged. Guinea-pig 2604 inoculated intraperitoneally with capsule contents showed after 153 days a purulent nodule in the omentum only; from it a culture was made but no growth occurred.
,,	G.P. 2243 (liver nodule).	27 days, 2nd generation.	G.P. **2396**	March 21, 1907	158 ,,	Capsule ruptured. Caseo-purulent nodules in omentum. The culture recovered from the capsule was unchanged. Guinea-pig 2605 inoculated intraperitoneally with capsule contents died in 17 days of acute avian tuberculosis. The spleen of Guinea-pig 2605 was inoculated into Guinea-pig 2619 which, killed 62 days later, showed only a purulent nodule in the omentum, from which an avian culture was isolated. Guinea-pigs 3212 and 3213 were inoculated subcutaneously each with a glycerin serum tube of culture recovered from the capsule, and when killed after 104 days showed local tuberculosis only.
P. II.	Rabbit 882 (joint)	95 days. 2nd generation.	G.P. **2436**	April 22, 1907	222 ,,	The capsule was intact and was completely filled with a turbid fluid. The culture was recovered from the capsule fluid and was unchanged. Guinea-pigs 3218 and 3219 were inoculated subcutaneously with a glycerin serum culture, and when killed after 104 days showed local tuberculosis only: cultures from both guinea-pigs were avian.
,,	,,	95 days, 2nd generation.	G.P. **2437**	April 22, 1907	30 ,,	The culture was recovered from the capsule and was unchanged. Guinea-pigs 3210 and 3211 were inoculated subcutaneously each with a glycerin serum culture, and when killed after 104 days showed local tuberculosis only.
,,	Capsule from G.P. 2437.	165 days, 2nd generation.	G.P. **2941**	December 6, 1907	166 ,,	The capsule was ruptured and rolled up in the omentum. There were several purulent nodules in the spleen and liver. The culture from the capsule was unchanged. Guinea-pig 3186 inoculated subcutaneously with the capsule contents showed after 104 days a scar at the seat of inoculation, and a nodule (culture avian) in an inguinal gland without disease elsewhere. Guinea-pig 3187 inoculated intraperitoneally showed after 104 days purulent nodules in omentum and in peritoneum without disease elsewhere; a culture from the omentum was avian. Guinea-pigs 3222 and 3223 inoculated with culture recovered from the capsule showed after 107 days local tuberculosis only: cultures were made from Guinea-pigs 3222 and 3223 and were avian in characters.
P. III.	Calf 282	120 days, 3rd generation.	G.P. **1983**	May 1, 1906	39 ,,	The collodion sac was enclosed in a fibrous capsule. The culture was recovered and was unchanged

EXPERIMENTS ON GUINEA-PIGS WITH COLLODION CAPSULES—*continued.*

Number of Virus.	Source of Culture.	Age and Generation of Culture.	Number of Animal.	Date of Insertion.	Duration of Experiment.	Result.
P. III.	Capsule from G.P. 1983.	—	G.P. **2077**	June 12, 1906	42 days	The culture from the capsule was unchanged.
..	Calf 318	44 days, 2nd generation.	G.P. **1986**	May 1, 1906	40 „	The culture from the capsule was unchanged.
.,	Capsule from G.P. 1986.	—	G.P. **2078**	June 12, 1906	16 „	Capsule intact.
.,	Capsule itself from G.P. 2078.	—	G.P. **2118**	June 28, 1906	40 „	The culture from the capsule was contaminated. The capsule was intact and free in the peritoneal cavity.
P. XXI.	Original material.	12 days, 7th generation.	G.P. **1985**	May 1, 1906	98 „	The culture from the capsule was unchanged. Capsule was intact and free in the peritoneal cavity.
..	Capsule from G.P. 1985.	52 days, 2nd generation.	G.P. **2176**	November 1, 1906	231 „	No growth was obtained from the capsule contents. Guinea-pig 2530 inoculated intraperitoneally with the capsule contents was healthy when killed after 162 days.
„	„	52 days, 2nd generation.	G.P. **2177**	November 1, 1906	105 „	The capsule was ruptured and was adherent to the omentum which contained caseo-purulent nodules. The culture was recovered from the capsule and was unchanged. Two guinea-pigs, 3204 and 3205, inoculated subcutaneously were killed after 98 days and showed local disease only. From 3205 an avian culture was obtained.
..	„	258 days, primary.	G.P. **2440**	April 22, 1907	35 „	The capsule had leaked and in the omentum there were a few caseo-purulent nodules. The culture recovered was unchanged.
„	Capsule itself from G.P 2440.	—	G.P. **2500**	May 27, 1907	186 „	The capsule was free, intact and completely filled with turbid fluid. The culture obtained was unchanged. Guinea-pigs 3216 and 3217 were inoculated subcutaneously each with the culture from a glycerin serum tube. Guinea-pig 3216 killed after 104 days showed a local nodule only; Guinea-pig 3217 after 84 days had local tuberculosis only.
„	Capsule from G.P. 2177.	26 days, 2nd generation.	G.P. **2438**	November 22, 1907	126 „	The capsule had leaked and was found lying in the centre of a caseo-purulent tumour. The culture recovered was unchanged. Guinea-pig 2602 inoculated intraperitoneally with capsule contents when killed after 153 days showed no tuberculosis.
„	„	26 days, 2nd generation.	G.P. **2439**	November 22, 1907	221 „	The capsule was intact and quite filled with fluid; it was free in the peritoneal cavity. The culture was unchanged. Guinea-pigs 3214 and 3215 were inoculated subcutaneously each with the culture from a glycerin serum tube, and when killed after 104 days showed local disease only.

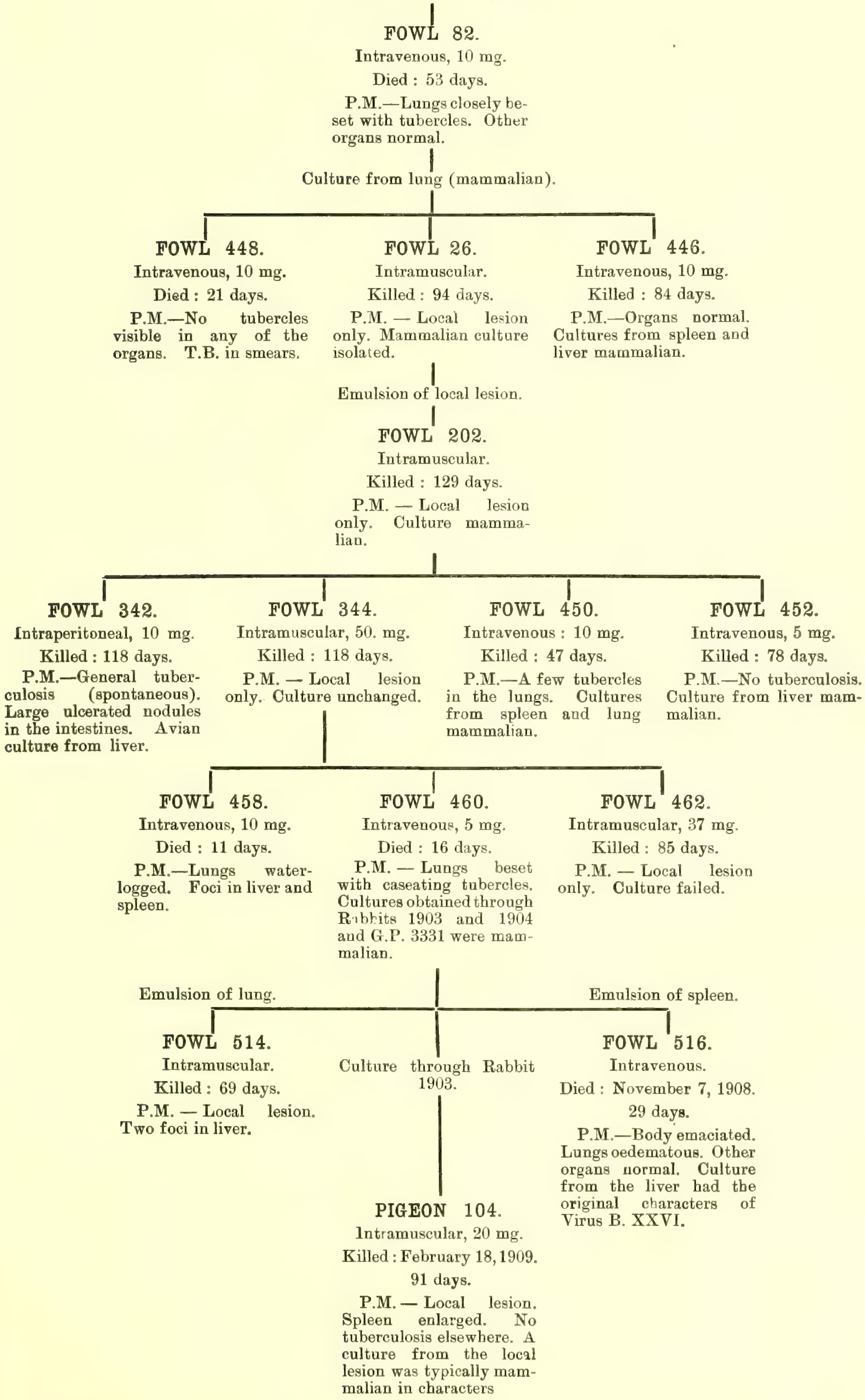
PASSAGE EXPERIMENTS ON FOWLS WITH MAMMALIAN TUBERCLE BACILLI.

No. I.

CULTURE OF VIRUS B. XXVI.

17th generation, 14 days old. Total duration in cultivation, 359 days.

INOCULATED JULY 26, 1906.



FOWL 82.
Intravenous, 10 mg.
Died : 53 days.
P.M.—Lungs closely beset with tubercles. Other organs normal.

Culture from lung (mammalian).

FOWL 448.
Intravenous, 10 mg.
Died : 21 days.
P.M.—No tubercles visible in any of the organs. T.B. in smears.

FOWL 26.
Intramuscular.
Killed : 94 days.
P.M. — Local lesion only. Mammalian culture isolated.

FOWL 446.
Intravenous, 10 mg.
Killed : 84 days.
P.M.—Organs normal. Cultures from spleen and liver mammalian.

Emulsion of local lesion.

FOWL 202.
Intramuscular.
Killed : 129 days.
P.M. — Local lesion only. Culture mammalian.

FOWL 342.
Intraperitoneal, 10 mg.
Killed : 118 days.
P.M.—General tuberculosis (spontaneous). Large ulcerated nodules in the intestines. Avian culture from liver.

FOWL 344.
Intramuscular, 50. mg.
Killed : 118 days.
P.M. — Local lesion only. Culture unchanged.

FOWL 450.
Intravenous : 10 mg.
Killed : 47 days.
P.M.—A few tubercles in the lungs. Cultures from spleen and lung mammalian.

FOWL 452.
Intravenous, 5 mg.
Killed : 78 days.
P.M.—No tuberculosis. Culture from liver mammalian.

FOWL 458.
Intravenous, 10 mg.
Died : 11 days.
P.M.—Lungs waterlogged. Foci in liver and spleen.

FOWL 460.
Intravenous, 5 mg.
Died : 16 days.
P.M. — Lungs beset with caseating tubercles. Cultures obtained through Rabbits 1903 and 1904 and G.P. 3331 were mammalian.

FOWL 462.
Intramuscular, 37 mg.
Killed : 85 days.
P.M. — Local lesion only. Culture failed.

Emulsion of lung.

Emulsion of spleen.

FOWL 514.
Intramuscular.
Killed : 69 days.
P.M. — Local lesion. Two foci in liver.

Culture through Rabbit 1903.

FOWL 516.
Intravenous.
Died : November 7, 1908.
29 days.
P.M.—Body emaciated. Lungs oedematous. Other organs normal. Culture from the liver had the original characters of Virus B. XXVI.

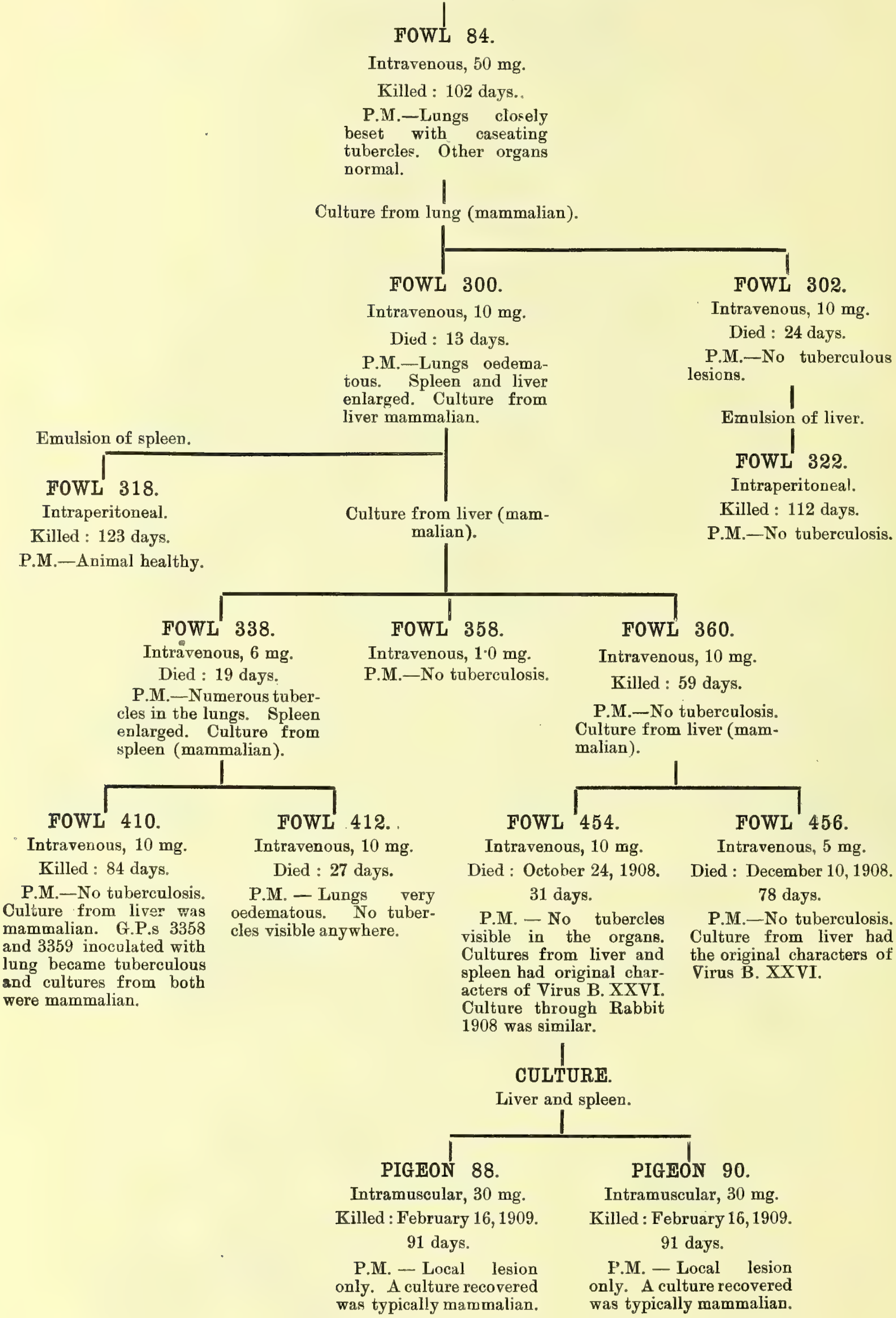
PIGEON 104.
Intramuscular, 20 mg.
Killed : February 18, 1909.
91 days.
P.M. — Local lesion. Spleen enlarged. No tuberculosis elsewhere. A culture from the local lesion was typically mammalian in characters

No. II.

CULTURE OF VIRUS B. XXVI.

17th generation, 14 days old. Total duration in cultivation, 359 days.

INOCULATED JULY 26, 1906.



FOWL 84.
Intravenous, 50 mg.
Killed : 102 days.
P.M.—Lungs closely beset with caseating tubercles. Other organs normal.

Culture from lung (mammalian).

FOWL 300.
Intravenous, 10 mg.
Died : 13 days.
P.M.—Lungs oedematous. Spleen and liver enlarged. Culture from liver mammalian.

FOWL 302.
Intravenous, 10 mg.
Died : 24 days.
P.M.—No tuberculous lesions.

Emulsion of liver.

FOWL 322.
Intraperitoneal.
Killed : 112 days.
P.M.—No tuberculosis.

Emulsion of spleen.

FOWL 318.
Intraperitoneal.
Killed : 123 days.
P.M.—Animal healthy.

Culture from liver (mammalian).

FOWL 338.
Intravenous, 6 mg.
Died : 19 days.
P.M.—Numerous tubercles in the lungs. Spleen enlarged. Culture from spleen (mammalian).

FOWL 358.
Intravenous, 1·0 mg.
P.M.—No tuberculosis.

FOWL 360.
Intravenous, 10 mg.
Killed : 59 days.
P.M.—No tuberculosis. Culture from liver (mammalian).

FOWL 410.
Intravenous, 10 mg.
Killed : 84 days.
P.M.—No tuberculosis. Culture from liver was mammalian. G.P.s 3358 and 3359 inoculated with lung became tuberculous and cultures from both were mammalian.

FOWL 412.
Intravenous, 10 mg.
Died : 27 days.
P.M. — Lungs very oedematous. No tubercles visible anywhere.

FOWL 454.
Intravenous, 10 mg.
Died : October 24, 1908.
31 days.
P.M. — No tubercles visible in the organs. Cultures from liver and spleen had original characters of Virus B. XXVI. Culture through Rabbit 1908 was similar.

FOWL 456.
Intravenous, 5 mg.
Died : December 10, 1908.
78 days.
P.M.—No tuberculosis. Culture from liver had the original characters of Virus B. XXVI.

CULTURE.
Liver and spleen.

PIGEON 88.
Intramuscular, 30 mg.
Killed : February 16, 1909.
91 days.
P.M. — Local lesion only. A culture recovered was typically mammalian.

PIGEON 90.
Intramuscular, 30 mg.
Killed : February 16, 1909.
91 days.
P.M. — Local lesion only. A culture recovered was typically mammalian.

LIST OF FOWLS, INOCULATED WITH MAMMALIAN TUBERCLE BACILLI, FROM WHICH CULTURES WERE RECOVERED.

Virus.	Material Inoculated.	Number.	Date of Inoculation.	Duration of Life.	Dose and Method of Inoculation.	Result.
B. IV.	Contents of capsule from Fowl 64.	122	October 31, 1906	Killed 83 days	Intravenous	Animal in good condition. There was a small necrotic nodule around the vein at the seat of inoculation. A culture from this was unchanged in type.
,,	Culture from the lung of Chimpanzee 24.	414	September 7, 1908	Died 21 days	10·0 mg. Intravenous.	Lungs oedematous. Yellow foci in the liver. T.B. in organs. Rabbit 1899 inoculated from lung died of general tuberculosis and the culture from its spleen was mammalian.
,,	,,	416	September 7, 1908	Killed 84 days	10·0 mg. Intravenous.	No tuberculosis. Liver and spleen enlarged. Cultures from the liver and spleen were unchanged. Guinea-pigs 3360 and 3361 inoculated with the lung developed general tuberculosis, and cultures isolated from each were mammalian.
,,	Culture from Calf 118	420	September 8, 1908	Died 20 days	10·0 mg. Intravenous.	Numerous minute tubercles in the lungs. Liver and spleen enlarged. Rabbit 1898 inoculated with the lung died of general tuberculosis, and the culture isolated from its spleen was mammalian.
,,	Emulsion of lung from Fowl 420.	488	September 28, 1908	Killed 80 days	Intraperitoneal	Peritoneal tuberculosis. A few tubercles in the spleen and liver. Intestines normal. Cultures from a peritoneal nodule and the spleen were mammalian.
B. V.	Culture from Guinea-pig 711.	426	September 9, 1908	Killed 84 days	10·0 mg. Intravenous.	Organs appeared normal. Cultures from the liver and spleen failed. Guinea-pigs 3364 and 3365 inoculated with the lung developed general tuberculosis, and a culture from the former was mammalian.
,,	,,	428	September 9, 1908	Died 28 days	10·0 mg. Intravenous.	No tuberculosis. Lungs oedematous. Rabbits 1901 and 1902 inoculated with the lung developed general tuberculosis, and cultures from both were mammalian. Two guinea-pigs 3325 and 3326 inoculated with the lung became tuberculous and a culture from the former was mammalian.
B. VI.	Culture from the original material.	422	September 8, 1908	Killed 84 days	10·0 mg. Intravenous.	No tuberculosis. Cultures from the liver and spleen failed. Guinea-pigs 3362 and 3363 inoculated with the lung developed general tuberculosis.
,,	,,	424	September 8, 1908	Killed 62 days	10·0 mg. Intravenous.	No tuberculosis. Cultures from the spleen and liver were unchanged. Rabbit 1912 and Guinea-pig 3342 inoculated with the lung developed tuberculosis and cultures from both were mammalian.
B. VII.	Culture from the original material.	442	September 9, 1908	Died 42 days	10·0 mg. Intravenous.	No tuberculosis. Cultures from the spleen and liver were unchanged. Pigeon 110 inoculated intramuscularly with 4 mg. of culture from the spleen died in 54 days and showed a local lesion and one lung quite solid and beset with opaque foci (numerous T.B.); a culture from the lung of pigeon was mammalian.
,,	,,	444	September 9, 1908	Died 60 days	10·0 mg. Intravenous.	Lungs oedematous; no tubercles. Liver enlarged. A culture from the lung was unchanged.
B. IX.	Culture from the liver of Dog 130.	430	September 9, 1908	Died 36 days	10·0 mg. Intravenous.	Caseating tubercles in the lungs. Liver and spleen enlarged. Cultures from the lung and liver were unchanged. Rabbit 1905 inoculated with the lung developed general tuberculosis and the culture from it was mammalian. Pigeons 80 and 82 inoculated intramuscularly, each with 24 mg. developed local tuberculosis only, and cultures isolated were mammalian.
,,	,,	432	September 9, 1908	Died 51 days	10·0 mg. Intravenous.	Organs appeared normal. A culture from the liver was unchanged. Rabbit 1909 inoculated with the lung died of general tuberculosis, and a culture from the spleen was mammalian.
B. XXVI.	Culture from the original material.	2	November 20, 1905	Killed 84 days	10·0 mg. Intramuscular.	Local lesion only. The culture obtained from the local lesion resembled that inoculated.

LIST OF FOWLS, INOCULATED WITH MAMMALIAN TUBERCLE BACILLI, FROM WHICH CULTURES WERE RECOVERED—*continued.*

Virus.	Material Inoculated.	Number.	Date of Inoculation.	Duration of Life.	Dose and Method of Inoculation.	Result.
B. XXVI.—*continued.*	Culture from the original material.	4	November 20, 1905	Killed 85 days	10·0 mg. Intramuscular.	Local lesion consisting of yellow necrotic substance. Beneath the capsule of the liver was a single whitish tubercle. The culture from the local lesion resembled that inoculated. No growth was obtained from the liver tubercle.
"	"	82	July 26, 1906	Died 53 days	10·0 mg. Intravenous.	Lungs closely beset with tubercles up to 1 mm. in diameter; other organs normal. In primary cultures made from the lung numerous colonies grew; subcultures from these were tested and resembled the culture inoculated.
"	"	84	July 26, 1906	Killed 102 days	50·0 mg. Intravenous.	Post-mortem appearances similar to the above. The culture isolated from the lung resembled that inoculated.
"	Culture from Fowl 82	126	November 9, 1906	Killed 94 days	Intramuscular	Yellow necrotic local lesion. No disease elsewhere. The culture grown from the local lesion resembled that inoculated.
"	Emulsion of local lesion from Fowl 126.	202	February 11, 1907	Killed 129 days	Intramuscular	Bright yellow staining of the muscle at the seat of inoculation. No disease elsewhere. Culture from the local lesion resembled that inoculated.
"	Culture from the lung of Fowl 84.	300	September 13, 1907	Died 13 days	10·0 mg. Intravenous.	Spleen and liver enlarged, lungs oedematous. No tubercles visible in the organs. Cultures from the liver and spleen resembled that inoculated. Fowl 318, inoculated intraperitoneally with an emulsion of the spleen of Fowl 300, when killed after 123 days was healthy.
"	Culture from the liver of Fowl 300.	338	January 28, 1908	Died 19 days	6·0 mg. Intravenous.	Spleen enlarged, liver enlarged and ruptured, filling the peritoneal cavity with blood. Lung, oedematous, showed beneath the surface numerous translucent tubercles with opaque centres. Cultures made from the spleen were unchanged in characters.
"	Culture from the local lesion of Fowl 202.	342	January 28, 1908	Killed 118 days	10·0 mg. Intravenous.	There were moderately numerous caseous nodules in the liver, lung, and spleen. In the intestines there were large ulcerated nodules projecting on the peritoneal surface. The culture made from the liver was avian in character. This was obviously a case of natural tuberculosis.
"	"	344	January 28, 1908	Killed 118 days	50·0 mg. Intravenous.	Layers of yellow necrotic substance in the muscle. No disease elsewhere. Two colonies grew on the culture tubes sown from the local lesion. The culture was unchanged.
"	Culture from the liver of Fowl 300.	360	March 3, 1908	Killed 59 days	10·0 mg. Intravenous.	No tuberculosis of the organs. A culture isolated from the liver resembled that of Virus B. XXVI.
"	Culture from the spleen of Fowl 338.	410	September 7, 1908	Killed 84 days	10·0 mg. Intravenous.	No tuberculosis. A culture from the liver was unchanged. Guinea-pigs 3358 and 3359, inoculated with the lung, developed general tuberculosis, and cultures from both were mammalian.
"	Culture from the lung of Fowl 82.	446	September 9, 1908	Killed 84 days	10·0 mg. Intravenous.	No tuberculosis. Cultures from the spleen and liver were unchanged. Guinea-pigs 3368 and 3369, inoculated with the lung, developed general tuberculosis, and a culture from the former was mammalian.
"	Culture from the local lesion of Fowl 202.	450	September 23, 1908	Killed 47 days	10·0 mg. Intravenous.	A few tubercles in the lungs. Liver enlarged. Cultures from the spleen and lung were unchanged. Rabbit 1917 and Guinea-pig 3346, inoculated with the lung, died of tuberculosis, and a culture from the former was mammalian.
"	"	452	September 23, 1908	Killed 78 days	5·0 mg. Intravenous.	No tuberculosis. A culture from the liver was unchanged.
"	Culture from the liver of Fowl 360.	454	September 23, 1908	Died 31 days	10·0 mg. Intravenous.	No tuberculosis. Cultures from the liver and spleen were unchanged. Rabbit 1908 died of general tuberculosis, and a culture from the spleen was mammalian. Pigeons 88 and 90, inoculated each with 31 mg. of culture from the liver and spleen, showed after 91 days local tuberculosis only, and the cultures isolated were mammalian.
"	"	456	September 23, 1908	Killed 78 days	5·0 mg. Intravenous.	No tuberculosis. A culture from the liver was unchanged.

”	Culture from the local lesion of Fowl 344.	460	September 23, 1908	Died 16 days	5·0 mg. Intravenous	Numerous tubercles in the lungs. Liver and spleen enlarged. Rabbit 1903 and Guinea-pig 3331, inoculated with the spleen, and Rabbit 1904 and Guinea-pig 3332, inoculated with the lung, all died of general tuberculosis, and cultures from the two rabbits and one guinea-pig were mammalian. The culture from Rabbit 1903, inoculated into Pigeon 104, caused in 91 days a local lesion and enlargement only of the spleen, and a culture isolated was mammalian.
”	Emulsion of spleen from Fowl 460.	516	October 9, 1908	Died 29 days	3·0 cc. Intravenous.	Lungs oedematous. Other organs appeared normal. A culture from the liver was unchanged. Rabbit 1910 and Guinea-pig 3340 inoculated with the lung died of general tuberculosis, and a culture from the former was mammalian.
P. IV.	Culture from the capsule of Pigeon 64.	394	June 26, 1908	Killed 94 days	Intramuscular	Local lesion only. A culture from the local lesion was unchanged. A culture from the liver failed. Pigeons 84 and 86 inoculated intramuscularly, each with 36 mg. of culture from the local lesion, developed local tuberculosis only (91 days), and cultures isolated were mammalian.
P. XL.	Culture from the original material.	230	April 8, 1907	Killed 100 days	1·0 mg. Intravenous.	Organs appeared healthy. In a primary culture made from the liver numerous colonies grew which, when tested, resembled the culture inoculated.
”	Culture from the liver of Fowl 230.	470	September 24, 1908	Killed 46 days	82·0 mg. Intramuscular (partly intravenous).	No tuberculosis. A culture from the lung was unchanged. Rabbit 1916 inoculated with the lung showed slight tuberculosis, and a culture from its lung was mammalian. Guinea-pig 3345 inoculated with the lung developed a slight general tuberculosis, and a culture from it was mammalian.
”	”	472	September 24, 1908	Killed 77 days	5·0 mg. Intravenous.	A few caseating tubercles in the lungs and grey points in the liver. A culture from the lung was unchanged ; a culture from the liver failed.
E. II.	Culture from the capsule of Pigeon 60.	396	June 26, 1908	Killed 95 days	Intramuscular	Local lesion only. A culture from the local lesion was unchanged. A culture from the liver failed. Pigeons 100 and 102 each inoculated with 37 mg. of culture from the local lesion showed after 91 days local tuberculosis only, and the cultures isolated were mammalian.
”	Culture from the capsule of Pigeon 62.	398	June 26, 1908	Killed 94 days	Intramuscular	Local lesion. A few foci in the liver. A culture from the local lesion was mammalian, and cultures from the spleen and liver failed. Pigeons 96 and 98, each inoculated with 26 mg. of culture from the local lesion, showed after 91 days local tuberculosis only, and the cultures isolated were mammalian.
”	Culture from the original material.	402	September 7, 1908	Killed 63 days	10·0 mg. Intravenous.	No tuberculosis. Liver enlarged. Cultures from the lung and spleen were unchanged. Rabbit 1911 and Guinea-pig 3341 inoculated with the lung developed slight tuberculosis, and cultures from both were mammalian.
”	Culture from the mediastinal gland of Calf 406.	434	September 9, 1908	Killed 61 days	10·0 mg. Intravenous.	No tuberculosis. Liver enlarged. Culture from spleen failed. Culture from Guinea-pig 3344 which developed slight tuberculosis failed. Culture from Rabbit 1915 inoculated with the spleen of fowl was mammalian.
”	”	436	September 9, 1908	Killed 84 days	10·0 mg. Intravenous.	No tuberculosis. Cultures from the liver and spleen were unchanged. Guinea-pigs 3366 and 3367 developed local disease only.
”	Culture from capsule of Fowl 368.	464	September 23, 1908	Killed 85 days	92·0 mg. Intramuscular.	Local lesion only. A culture from the local lesion was unchanged.
”	”	466	September 23, 1908	Killed 78 days	5·0 mg. Intravenous.	No tuberculosis. A culture from the lung was unchanged.
”	”	468	September 23, 1908	Killed 47 days	10·0 mg. Intravenous.	No tuberculosis. Liver a little enlarged. A culture from the spleen was unchanged. Guinea-pig 3343 developed tuberculosis and a culture from an inguinal gland was mammalian.
E. IV.	Culture from the original material.	136	November 20, 1906	Died 59 days	20·0 mg. Intravenous.	Body emaciated. Spleen enlarged. Lungs oedematous. Liver and kidneys normal. Cultures made from the liver were similar to that inoculated.
”	”	406	September 7, 1908	Killed 63 days	10·0 mg. Intravenous.	No tuberculosis. A culture from the liver was unchanged.

LIST OF FOWLS, INOCULATED WITH MAMMALIAN TUBERCLE BACILLI, FROM WHICH CULTURES WERE RECOVERED—*continued.*

Virus.	Material Inoculated.	Number.	Date of Inoculation.	Duration of Life.	Dose and Method of Inoculation.	Result.
E. IV.—*continued.*	Culture from the original material.	408	September 8, 1908	Killed 101 days	10·0 mg. Intramuscular.	Local lesion only. A culture from the local lesion was unchanged.
„	Culture from the prescapular gland of Calf 408.	438	September 9, 1908	Died 21 days	10·0 mg. Intravenous.	Lungs closely beset with caseous tubercles. Liver enlarged. Cultures from the lung and spleen were unchanged. Rabbit 1900 and Guinea-pig 3324 inoculated with the lung developed slight tuberculosis. Cultures from both were mammalian. Pigeons 92 and 94 each inoculated with 57 mg. of culture from the spleen, after 91 days showed local tuberculosis and cultures isolated were mammalian.
„	„	440	September 9, 1908	Died 39 days	10·0 mg. Intravenous.	Lungs oedematous. Liver enlarged. Spleen pale. Cultures from the spleen and lung were unchanged. Guinea-pig 3333, inoculated with the lung, developed slight tuberculosis, and cultures from the inguinal and sternal glands were mammalian. Pigeons 106 and 108, inoculated each with 20 mg. of cultures from the liver and spleen of the fowl, showed, after 91 days, local tuberculosis only, and a culture from Pigeon 108 was mammalian.
„	Culture from the original material.	482	September 24, 1908	Killed 46 days	10·0 mg. Intravenous.	A few tubercles in the lungs. Liver and spleen enlarged. A culture from the spleen was unchanged. Rabbit 1918, inoculated intravenously with the fowl's lung, developed slight tuberculosis, and a culture from its lung was mammalian. Guinea-pig 3347, inoculated with the lung, developed general tuberculosis, and a culture from the inguinal gland was mammalian.

LIST OF FOWLS, INOCULATED WITH MAMMALIAN TUBERCLE BACILLI, FROM WHICH CULTURES WERE NOT RECOVERED.

B. V.	Culture from the capsule of Pigeon 68.	400	June 26, 1908	Killed 94 days	Intramuscular.	Local lesion. Two yellow nodules in the liver. Cultures failed.
B. XII.	Culture from the original material.	280	June 22, 1907	Killed 157 days	1·0 mg. Intravenous.	Animal healthy. Cultures were made from the spleen and liver but no growth occurred.
„	„	294	September 6, 1907	Killed 143 days	164·0 mg. Intramuscular.	Layers of bright yellow necrotic substance in the breast muscle. No disease elsewhere. A culture was made from the local lesion but no growth occurred.
B. XXVI.	Culture from the original material.	304	September 19, 1907	Killed 244 days	1·0 mg. Intravenous.	No tuberculosis. A culture was made from the liver but no growth occurred.
„	„	308	September 19, 1907	Killed 131 days	50·0 mg. Intraperitoneal.	Inoculation partly into the extraperitoneal fat where there was a yellow necrotic tumour. A few tubercles on the omentum. No disease elsewhere. Cultures were made from the liver and spleen but no growth occurred.
„	Emulsion of spleen of Fowl 300.	318	September 26, 1907	Killed 123 days	Intraperitoneal.	Animal healthy. A culture was made from the liver but no growth occurred.

"	Culture from the local lesion of Fowl 344.	462	September 23, 1908	Killed 85 days	37·0 mg. Intramuscular.	Local lesion only. Cultures failed.
P. IV.	Contents of capsule from Fowl 86.	166	November 30, 1906	Killed 73 days	Intraperitoneal.	Numerous nodules and tubercles on the mesentery and peritoneum consisting of yellow necrotic substance within translucent capsules. In the liver there were a few yellow necrotic foci. No disease elsewhere. Cultures were made from four mesenteric nodules but no growth occurred.
P. XLI.	Culture from the original material.	128	November 15, 1906	Killed 103 days	15·0 mg. Intravenous.	Animal in good condition. Scattered throughout the liver were discrete grey foci (a few T.B.). A culture was made from the liver, but no growth occurred.
"	"	186	January 24, 1907	Killed 68 days	100·0 mg. Intraperitoneal.	The mesentery was thickened and contracted by nodules and bands of translucent tissues enclosing yellow necrotic substance. Numerous similar nodules on the peritoneum and peritoneal ligaments. No disease elsewhere. Cultures were sown from three of the mesenteric nodules, but no growth occurred.
E. II.	Culture from the original material.	140	November 20, 1906	Killed 98 days	10·0 mg. Intravenous.	Lungs congested, a few foci in the liver. No T.B. in smear preparations made from the liver and spleen. A culture was made from the liver, but no growth occurred.
"	"	404	September 7. 1908	Killed 84 days	10·0 mg. Intravenous.	No tuberculosis. Liver a little enlarged. Cultures from the spleen and liver failed. Guinea-pigs 3356 and 3357 were inoculated with the lung; the latter remained healthy and the former developed local tuberculosis from which a culture failed.
Z. III.	Culture from the original material (Antelope).	474	September 24, 1908	Killed 77 days	10·0 mg. Intravenous.	No tuberculosis. Cultures failed.
Z. V.	Culture from the original material (Chimpanzee).	478	September 24, 1908	Killed 84 days	100·0 mg. Intramuscular.	Local lesion. Liver enlarged showed one tubercle. Cultures from the local lesion and liver failed.
"	"	480	September 24, 1908	Killed 77 days	10·0 mg. Intravenous.	An occasional tubercle in the lungs. Cultures from lung and liver failed.

DOG PASSAGE EXPERIMENTS.

No. 1.

CULTURE FROM ORIGINAL MATERIAL OF VIRUS B. VIII AFTER 652 DAYS ARTIFICIAL CULTIVATION.
The 29th generation of culture was used when 26 days old.

DOG 102.

Fed : March 7, 1906. Dose : 100·0 mg. Killed : 72 days. P M.—Nodule in lung only.

Culture from lung.

DOG 142.

Fed.
Dose : 84·0 mg.
Killed : November 28, 1907.
274 days.

P.M.—Miliary tubercles in the lungs. No disease elsewhere.

Culture derived from the mesenteric gland through Guinea-pig 2921.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1655	Intrav.	1·0 mg.	D. 11 days	G. T.
1654	Intrav.	0·1 mg.	D. 17 "	G. T.
1653	Intrav.	0·01 mg.	D. 25 "	G. T.
1657	Subcut.	50·0 mg.	D. 32 "	G. T.
1656	Subcut.	10·0 mg.	D. 61 "	G. T.

DOG 144.

Intraperitoneal.
Dose : 1·0 mg.
Died : April 4, 1907.
36 days.
P.M.—Acute tuberculosis.

DOG 146.

Intraperitoneal.
Dose : 10·0 mg.
Died : March 19, 1907.
20 days.
P.M.—Acute tuberculosis.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1254	Intrav.	1·0 mg.	D. 14 days	G. T.
1255	Intrap.	1·0 mg.	D. 18 "	G. T.
1257	Subcut.	10·0 mg.	D. 49 "	G. T.
1256	Subcut.	1·0 mg.	D. 93 "	G. T.

Culture from liver.

DOG 158.

Subcutaneous.
Dose : 50·0 mg.
Killed : January 21, 1908.
214 days.

P.M.—Two foci in lungs. No disease elsewhere.

DOG 156.

Intravenous.
Dose : 0·1 mg.
Killed : December 6, 1907.
168 days.

P.M. — Tuberculosis (slight) of lungs and liver.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1372	Intrav.	1·0 mg.	D. 17 days	G. T.
1371	Intrav.	0·1 mg.	D. 24 "	G. T.
1374	Subcut.	10·0 mg.	D. 32 "	G. T.
1373	Subcut.	1·0 mg.	D. 83 "	G. T.

Culture from Lung (direct).

RABBITS.

1650	Intrav.	1·0 mg.	D. 14 days	G. T.
1649	Intrav.	0·1 mg.	D. 25 "	G. T.
1648	Intrav.	0·01 mg.	D. 26 "	G. T.
1652	Subcut.	50·0 mg.	D. 51 "	G. T.
1651	Subcut.	10·0 mg.	D. 47 "	G. T.

Culture from Lung (through Guinea-pig 2942).

RABBITS.

1676	Intrav.	1·0 mg.	D. 17 days	G. T.
1675	Intrav.	0·1 mg.	D. 20 "	G. T.
1678	Subcut.	50·0 mg.	D. 55 "	G. T.
1677	Subcut.	10·0 mg.	D. 122 "	G. T.

DOG PASSAGE EXPERIMENTS—*continued.*

No. 2.

CULTURE OF VIRUS B. IX.
The 17th generation, 21 days old, was used on JULY 10, 1905. The total duration of artificial cultivation was 385 days.

DOG 60.
Fed.
Dose : 1·0 mg.
Killed : October 30, 1905.
112 days.
P.M.—Retrogressive tuberculosis of pharyngeal, mesenteric, and ileo-colic glands.

CULTURE.

DOG 130.
Subcutaneous.
Dose : 48·0 mg.
Died : August 10, 1906.
85 days.
P.M.—General tuberculosis.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
637	Intrav.	0·1 mg.	D. 28 days	G. T.
639	Intrap.	1·0 mg.	D. 28 „	G. T.
638	Intrap.	0·1 mg.	D. 25 „	G. T.
640	Subcut.	1·0 mg.	D. 161 „	G. T.
641	Subcut.	0·1 mg.	D. 78 „	G. T.

CULTURE (Liver).

DOG 136.
Fed.
Dose : 50·0 mg.
Killed : November 30, 1907.
302 days.
P.M.—Caseous patches in the mesenteric glands. Grey nodule in lung. No disease elsewhere.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1224	Intrav.	1·0 mg.	D. 16 days	G. T.
1225	Intrap.	1·0 mg.	D. 76 „	G. T
1227	Subcut.	10·0 mg.	D. 87 „	G. T
1226	Subcut.	1·0 mg.	D. 64 „	G. T

Culture from the bronchial gland through G.P. 2935.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1672	Intrav.	1·0 mg.	D. 15 days	G. T.
1671	Intrav.	0·1 mg.	D. 23 „	G. T.
1673	Subcut.	10·0 mg.	D. 47 „	G. T.

Culture from lung direct.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1688	Intrav.	1·0 mg.	D. 14 days	G. T.
1687	Intrav.	0·1 mg.	D. 11 „	Early G. T. (psorospermosis).
1691	Intrav.	0·1 mg.	D. 15 „	G. T.
1689	Subcut.	50·0 mg.	D. 126 „	G. T.
1690	Subcut.	10·0 mg.	D. 90 „	G. T.

DOG PASSAGE EXPERIMENTS—*continued.*

No. 3.

CULTURE OF VIRUS B. IV.
Total duration of artificial cultivation, 660 days. The culture used was the 28th generation, 21 days old.

DOG 54.
Collodion capsule inserted May 20, 1905.
Intraperitoneal.
Killed : October 9, 1905.
142 days.

P.M.—Capsule ruptured and surrounded by a tumour ; there was tuberculosis of the peritoneum, spleen, and kidneys.

CULTURE (Contents of Capsule).

DOG 92.
Fed.
Dose : 25·0 mg.
Killed : March 27, 1906.
64 days.

P.M.—Tuberculosis of a submaxillary gland and twelve caseous nodules in the lung.

CULTURE (Lung).

DOG 138.
Fed.
Dose : 75·0 mg.
Killed : November 13, 1907.
273 days.

P.M.—Caseous patches in the cervical and coeliac glands. No disease elsewhere.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1242	Subcut.	10·0 mg.	D. 44 days	G. T.
1243	Subcut.	1·0 mg.	D. 107 „	G. T.
1009	Intrav.	1·0 mg.	D. 14 „	G. T.
1010	Intrav.	0·1 mg.	D. 21 „	G. T.
1013	Intrap.	1·0 mg.	D. 20 „	G. T.
1011	Intrap.	0·1 mg.	D. 26 „	G. T.
1012	Subcut.	1·0 mg.	K. 40 „	G. T. (slight).

DOG PASSAGE EXPERIMENTS—*continued*

No. 4.

Culture of Virus B. XXII., through Guinea-pig 1509.

Total duration of artificial cultivation, 135 days. The culture used was the 6th generation, 20 days old.

Inoculated, September 4, 1905.

DOG 72.

Intraperitoneal.

Dose : 1·0 mg.

Killed : February 7, 1906.

156 days.

P.M.—A few nodules and fibrous tubercles in the lungs ; yellow foci in the liver and doubtful tubercles in the kidneys.

CULTURE (Lung).

DOG 126.

Subcutaneous.

Dose : 10·0 mg.

Killed : August 16, 1906.

99 days.

P.M.—Local lesion. Tuberculosis of nearest glands ; three tubercles in the lungs, a few in liver.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
867	Intrav.	0·1 mg.	D. 26 days	G. T.
868	Intrap.	1·0 mg.	D. 19 „	G. T.
869	Intrap.	0·1 mg.	D. 8 „	Coccidiosis.
871	Subcut.	1·0 mg.	D. 109 „	G. T.
870	Subcut.	0·1 mg.	D. 55 „	G. T.

CULTURE (Liver).

DOG 134.

Fed.

Dose : 100·0 mgs.

Killed : November 22, 1907.

294 days.

P.M.—Caseous gritty patches in the mesenteric glands and three tubercles in the lungs. No disease elsewhere.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1228	Intrav.	1·0 mg.	D. 13 days	G. T.
1229	Intrap.	1·0 mg.	D. 26 „	G. T.
1231	Subcut.	10·0 mg.	D. 99 „	G. T.
1230	Subcut.	1·0 mg.	D. 55 „	G. T.

DOG PASSAGE EXPERIMENTS—*continued.*

No. 5

CULTURE FROM THE MESENTERIC GLAND OF CHIMPANZEE 8.

VIRUS B. IV.

Total duration of artificial cultivation, 79 days. The culture used was the 6th generation, 15 days old.

DOG 56.

Collodion capsule inserted June 8, 1905.

Intraperitoneal.

Killed : 76 days.

P.M.—Capsule ruptured and surrounded by a tumour. There was peritoneal tuberculosis and miliary tuberculosis of the lungs.

Culture from tumour.

DOG 74.

Subcutaneous.

Dose : 10·0 mg.

Killed : December 15, 1905.

63 days.

P.M.—Local lesion ; grey miliary tubercles in the lungs, and a few in the kidneys.

CULTURE.

Derived from the bronchial gland (apparently normal) through Guinea-pig 1808.

January 26, 1906.

DOG 116.

Fed.

Dose : 10·0 mg.

Killed : July 5, 1906.

98 days.

P.M. — Tuberculosis of pharyngeal, cervical, and mesenteric glands, liver, lungs, and bronchial glands.

Culture from lung.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1244	Intrav.	0·1 mg.	D. 17 days	G. T.
1248	Intrap.	0·1 mg.	D. 29 ,,	G. T.
1247	Subcut.	10·0 mg.	D. 48 ,,	G. T.
1271	Intrav.	0·1 mg.	D. 18 ,,	G. T.
1272	Intrap.	1·0 mg.	D. 13 ,,	G. T.
1274	Subcut.	10·0 mg.	D. 50 ,,	G. T.
1273	Subcut.	1·0 mg.	D. 30 ,,	G. T.

(*Continued on opposite page.*)

DOG 116 (*continued from preceding page*).

DOG 148.
Intraperitoneal.
Dose : 1·0 mg.
Killed : July 18, 1907. 133 days.
P.M.—Tubercles in the omentum : no disease elsewhere.

Culture from omentum.

DOG 150.
Fed.
Dose : 100·0 mg.
Killed : June 18, 1907. 103 days.
P.M.—Tuberculosis of Peyer's patches, mesenteric glands, and liver.

Culture from mesenteric gland.

DOG 140.
Fed.
Dose : 50·0 mg.
Killed : November 26, 1907. 284 days.
P.M.—Caseous patch in a cervical gland : no disease elsewhere.

DOG 166.
Fed.
Dose : 40·0 mg.
Killed : January 20, 1908. 178 days.
P.M.—Caseous patches in mesenteric glands. No other disease.

DOG 168.
Intravenous.
Dose : 0·01 mg.
Killed : January 18, 1908. 176 days.
P.M.—Tuberculosis of lungs and liver

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1432	Intrav.	0·1 mg.	D. 15 days	G. T.
1430	Intrav.	0·01 mg.	D. 25 ,,	G. T.
1431	Subcut.	1·0 mg.	D. 45 ,,	G. T.

DOG 174.
Intratracheal.
Dose : 33·0 mg.
Died : March 29, 1908. 62 days
P.M.—Septic pneumonia : a few T.B in organs.

DOG 172.
Intratracheal.
Dose : 1·0 mg.
Killed : July 4, 1908. 159 days.
P.M.—Tuberculosis of the epiglottis, and a few tubercles in the lung and liver.

Culture from epiglottis.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1889	Intrav.	1·0 mg.	D. 17 days	G. T.
1888	Intrav.	0·1 mg.	D. 16 ,,	G. T.
1887	Intrav.	0·01 mg.	D. 29 ,,	G. T.
1892	Subcut.	30·0 mg.	D. 66 ,,	G. T.
1890	Subcut.	10·0 mg.	D. 40 ,,	G. T.
1891	Subcut.	10·0 mg.	D. 46 ,,	G. T.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1607	Intrav.	1·0 mg.	D. 12 days	G. T.
1606	Intrav.	0·1 mg.	D. 21 ,,	G. T.
1608	Subcut.	10·0 mg.	D. 53 ,,	G. T.
1609	Subcut.	10·0 mg.	D. 48 ,,	G. T.

DOGS INOCULATED AND FED WITH CULTURES OF BOVINE TUBERCLE BACILLI.

Virus.	Source of Culture.	Age and Generation of Subculture Inoculated.	Total Duration of Cultivation.	Dose.	Date of Inoculation.	Number.	Method of Inoculation.	Duration of Life.	Result.
B. IV.	Lung of Dog 92	20 days old, 12th generation.	323 days	75·0 mg.	February 13, 1907.	138	Fed	Killed 273 days.	A few caseous streaks and patches in each superior cervical gland (T.B.) and a caseous tubercle in each coeliac gland (T.B.). Mesenteric glands appeared normal. Guinea-pigs inoculated with emulsions of the lung, mesenteric and coeliac glands remained healthy. No growth was obtained from the coeliac or cervical glands.
"	Lung of Dog 116.	15 days old, 9th generation.	225 days	50·0 mg.	February 15, 1907.	140	Fed	Killed 284 days.	The right superior cervical gland contained a moist whitish gritty nodule (12 T.B.). No tuberculosis elsewhere. Guinea-pigs inoculated with emulsions of the liver, mesenteric and cervical glands did not develop tuberculosis.
"	"	21 days old, 9th generation.	245 days	1·0 mg.	March 7, 1907	148	Intraperitoneal	Killed 133 days.	In the omentum there were five tubercles (T.B.) up to a millet seed in size; one was translucent, the rest were opaque and whitish. No tuberculosis elsewhere. Cultures isolated from two omental nodules were unchanged in characters or virulence.
"	"	"	"	100·0 mg.	"	150	Fed	Killed 103 days.	The Peyer's patches showed whitish caseous streaks and foci (T.B.) which were most clearly visible from the peritoneal surface. Fairly numerous soft whitish patches in the mesenteric glands (T.B.). A few submiliary tubercles in the liver (T.B.) and in the lungs (no T.B.). No disease elsewhere. Cultures isolated from the mesenteric glands were unchanged in characters or virulence. Guinea-pigs inoculated with emulsions of the spleen remained healthy. Guinea-pig 2528 inoculated with liver developed G.T., and a culture from the omentum had the characters of the original culture.
"	Mesenteric gland of Dog 150.	7 days old, 4th generation.	38 days	40·0 mg.	July 26, 1907	166	Fed	Killed 178 days.	In the mesenteric glands there were several soft whitish caseous patches (T.B.). No disease elsewhere.
"	"	"	"	0·01 mg.	"	168	Intravenous	Killed 176 days.	The lungs did not collapse and were firm and oedematous; the parenchyma was considerably replaced by grey translucent tissue, small pieces of which sank in water. A few grey points and a soft miliary nodule in the liver (T.B.). Guinea-pigs inoculated with emulsions of the lung and liver developed general tuberculosis. Cultures sown direct from the lungs were contaminated. A culture isolated from the lung through Guinea-pig 2958 was unchanged.
"	Omentum of Dog 148.	16 days old, 6th generation.	193 days	1·0 mg.	January 27, 1908.	172	Intratracheal	Killed 159 days.	The epiglottis was thickened and covered with flat grey translucent growths beset with caseous foci. A few transparent tubercles in the lungs. A few tubercles up to a rape seed (no T.B.) in the liver. A culture from the epiglottis was unchanged in characters or virulence.
"	"	"	"	33·0 mg.	"	174	Intratracheal	Died 62 days.	Caseous nodule in trachea at seat of inoculation. The right lung was reddish-grey, solid and airless and the left was congested and oedematous; the pleural cavities were filled with turbid fluid. The pneumonia and pleurisy were due to a coccal infection. Bronchial glands enlarged. Two or three tubercles in the kidneys (T.B.). Grey foci in the liver. Spleen normal.
B. VIII.	Lung of Dog 102.	21 days old, 10th generation.	285 days	84·0 mg.	February 27, 1907.	142	Fed	Killed 274 days.	In each lung there were a few grey nodules the size of millet seeds. No tuberculosis elsewhere. Guinea-pigs 2920 and 2922 inoculated with emulsions of the liver and kidney respectively remained healthy. Guinea-pig 2921 developed tuberculosis. A culture isolated from the mesenteric gland through Guinea-pig 2921 was unchanged in characters and virulence.

,,	,,	,,	,,	1·0 mg.	,,	144	Intraperitoneal	Killed dying 35 days.	Peritoneal cavity filled with fluid. Omentum and mesentery thickened and contracted. Liver speckled with numerous grey foci. Portal glands caseous. Spleen not enlarged. Kidneys pale. Lungs were congested and oedematous and closely filled with translucent tubercles up to 1 mm. in diameter, a few opaque in the centre. Bronchial glands showed caseous streaks and foci. Sternal glands enlarged, the right entirely caseous. Numerous T.B. in sternal gland, a few in the liver, spleen and peritoneal fluid. Cultures were recovered from the liver and sternal gland, and were unchanged.
,,	,,	,,	,,	10·0 mg.	,,	146	Intraperitoneal	Died 20 days.	Peritoneal cavity filled with fluid. Omentum thickened and composed of translucent tissue with a caseous network. Numerous translucent foci on the peritoneum and mesentery. Pyloric, coeliac, lumbar, and ventral mediastinal glands enlarged and partly caseous. Numerous grey points in the liver. Kidneys pale. Spleen firm. Lungs congested and oedematous; bronchial glands normal. A few T.B. in the lung and spleen. Numerous in the liver and the peritoneal fibrin. Cultures from the liver and mediastinal gland were unchanged in characters or virulence.
,,	Liver of Dog 146.	20 days old, 5th generation.	94 days	0·1 mg.	June 21, 1907	156	Intravenous	Killed 168 days.	The lungs contained scattered hard translucent miliary nodules. Grey foci beneath capsule of liver. No disease elsewhere. Lung nodule showed two T.B., liver substance none. Guinea-pigs 2942 and 2943 inoculated with emulsion of lung developed general tuberculosis. Cultures from the lung direct and through Guinea-pig 2942 were unchanged in characters or virulence.
,,	,,	,,	,,	50·0 mg.	,,	158	Subcutaneous	Killed 214 days.	The sinuses which had been produced at the seat of inoculation had healed perfectly. The animal was fat and well. In the lungs were two minute foci and no tuberculosis elsewhere. Cultures recovered from a subcutaneous cyst 103 days after inoculation were unchanged.
B. IX.	Liver of Dog 130.	21 days old. 7th generation.	175 days	50·0 mg.	February 1, 1907.	136	Fed	Killed 302 days.	The caudal mesenteric gland on each side of the mesentery and three smaller glands contained patches of whitish chalky fluid. In the anterior lobe of the right lung there was a grey nodule the size of a pea consisting of a central cavity and translucent walls beset with fine opaque streaks. Guinea-pigs inoculated with emulsions of the lung, mesenteric and bronchial glands developed general tuberculosis. A guinea-pig inoculated with liver remained healthy. A culture from the lung direct was unchanged in characters or virulence. A culture from the bronchial gland through Guinea-pig 2935 was unchanged in characters or virulence.
B. XI.	Original material.	21 days old, 31st generation.	1,453 days	50·0 mg.	January 24, 1908.	170	Fed	Killed 161 days.	The lungs contained a few grey tubercles with opaque centres up to a rape seed in size (no T.B.). Irregular grey foci in the liver (no T.B.). No disease elsewhere.
B. XII.	,,	21 days old, 33rd generation.	1,060 days	1·0 mg	June 22, 1907	160	Intravenous	Died 52 days.	The lungs were congested and oedematous and were closely filled with grey nodules up to 2 mm. in diameter, a few opaque in the centre. The spleen was enlarged and showed scattered necrotic patches in the pulp. Liver pale and mottled. Moderately numerous tubercles the size of a rape seed in the kidneys. Bronchial, ventral, mediastinal, mesenteric, and portal glands contained caseous patches. There were numerous tubercle bacilli in the liver, kidney, and ventral mediastinal glands. A culture recovered from the liver was unchanged.
B. XXII.	Liver of Dog 126	2 days old, 9th generation.	169 days	100·0 mg.	February 1, 1907.	134	Fed	Killed 294 days.	Three mesenteric glands contained small irregular caseous patches which were whitish, fluid and slightly gritty. Two translucent nodules in the lung just beneath the pleura. No disease elsewhere. Guinea-pigs inoculated, two from the mesenteric gland, one from the spleen, and one from the lung, remained healthy.

PASSAGE EXPERIMENT ON CHIMPANZEES WITH VIRUS B. IV.

(For previous details, *see* Second Interim Report, Part II., Vol. III., Page 94.)

The culture used, November 21, 1906, was derived from the bronchial gland of Chimpanzee 22, and had been since the experiment began in the bodies of four chimpanzees for a total period of 435 days.

CHIMPANZEE 24.
Subcutaneous.
Dose : 0·00001 mg.
Died : March 8, 1907.
107 days.

P.M.—Local tuberculosis severe. Moderately severe generalised tuberculosis. Cultures from the lung and sternal gland resembled that of the original culture of Virus B. IV.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
1086	Intrav.	1·0 mg.	D. 18 days	G. T.
1084	Intrav.	0·00001 mg.	D. 111 „	G. T.
1087	Subcut.	1·0 mg.	D. 44 „	G. T.

BABOON 76.
Subcutaneous.
0·00001 mg.
Died : February 18, 1907.
89 days.

P.M. — General tuberculosis. Cultures from lung and spleen resembled that of Virus B. IV.

PASSAGE EXPERIMENT ON BABOONS WITH VIRUS B. I.

(For previous details, *see* Second Interim Report, Part II., Vol. III., Page 96.)

The culture used, November 29, 1906, was derived from the lung of Baboon 64, and had been, since the experiment began, in the bodies of two baboons for a total period of 198 days.

BABOON 70.
Subcutaneous.
Dose : 0·0001 mg.
Died : March 26, 1907.
117 days.
P.M.—General tuberculosis.

Culture of bovine type recovered.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
857	Intrav.	0·1 mg.	D. 21 days	G. T.
858	Intrap.	1·0 mg.	D. 15 „	G. T.
859	Intrap.	0·1 mg.	D. 16 „	G. T.
860	Subcut.	1·0 mg.	K. 91 „ (dying).	G. T.

CHIMPANZEE 24. Virus B. IV.

Subcutaneous inoculation of culture derived from the bronchial gland of Chimpanzee 22.

Dose—0·00001 milligramme.

Date of Inoculation—November 21, 1906.

Died—March 8, 1907. [107 days after inoculation.]

Clinical History.

On December 8, 1906, a slight thickening was felt at the seat of inoculation beneath the skin to the left of the middle line of the back. This thickening and the axillary glands on the left side gradually increased in size, but there was no affection of the general health until January 21, 1907, 75 days after inoculation, when the appetite began to fail a little.

A few days later the skin over the tumour ulcerated.

On February 21 the animal was becoming thin and the eyelids were oedematous. It became subsequently very weak, with oedema of the whole face, and died March 8, 1907.

Temperature.

The temperature remained normal throughout the experiment.

Weights.

	kilos.
November 21, 1906	5·37
March 8, 1907	4·40

Loss in weight.—·97 kilo.

Tuberculin Test.

February 8, 1907. [79 days after the experiment began.] Dose of tuberculin (bovine), 0·5 cc. No reaction.

POST-MORTEM EXAMINATION.

The body was thin, with very little subcutaneous fat.

Local Lesion.—In the skin of the back there was a small irregular ulcer with congested margins about 1·5 cm. in length, and in the subcutaneous tissue beneath was a slightly raised thickening 3 by 4 cm. This on section consisted of firm fibroid tissue beset with caseous foci and surrounding a small cavity, containing a little caseous substance, with which the ulcer communicated. From the anterior part of the tumour there was in the skin a sinus running up to the neck, filled with soft caseous substance.

Axillary Glands.—In the right axilla there was a rounded mass of glands 4 by 2·5 cm. firmly adherent to the skin, which was reddened and on the point of ulcerating. On section it consisted of two glands which were made up of central reddish necrotic tissue becoming caseous and caseo-purulent towards the periphery. At the apex of the axilla there were several smaller oedematous glands.

In the left axilla there was a tumour 5·5 by 4 cm. adherent to the skin which was ulcerated; the main part consisted of translucent tissue filled with caseo-purulent nodules. The rest consisted of two glands the size of sparrow's eggs similar to those in the right axilla.

At the apex of axilla there were six glands; one the size of a sparrow's egg was almost entirely caseous; two smaller contained caseous nodules and three were normal.

On the left side of the neck there was a tumour 5·5 by 3 by 3 cm.; it was partly under the sterno-mastoid, but the majority of it was situated in the posterior triangle. On section it was made up of a mass of glands considerably caseated in which were islands of reddish translucent tissue. It was adherent to the skin in which there was a congested ulcer with rounded margins.

On the right side of the neck, displacing the sterno-mastoid forward, was an elongated tumour projecting backwards and measuring 6 by 3 by 4 cm.; it was adherent to the skin, which was ulcerated, and on section consisted of large glands almost completely caseated and softened.

Parotid Glands.—In the left parotid region there were two glands 1 cm. in diameter which were deeply congested in parts, but were not soft or caseous.

The right parotid gland was normal.

Superior Cervical Glands.—Normal.

Submaxillary Glands.—Normal.

In the interval on the left side, between the angle of the jaw and the mastoid process, there was one caseous gland and about four or five which showed no opacities.

Thorax.

Pleura.—In the right pleural cavity there were numerous long slender adhesions; there were a few also in the left. Beneath the pleura, at about the level of the angle of the ribs, there were three caseous nodules.

Diaphragm.—The diaphragm was infiltrated with caseated tissue, while on the peritoneal surface there were numerous translucent tubercles; in addition in the substance there were five nodules projecting on both surfaces and up to 5 mm. in diameter.

Lungs.—The lungs did not collapse normally, they were oedematous and emphysematous around the margins; they showed on the surface and in the substance scattered grey nodules, the largest caseous in the centre, varying from a point up to 4 mm. in diameter.

Thoracic Lymphatic Glands.

In one left bronchial gland there was a caseous focus; the rest of the left bronchial glands and those on the right side appeared normal.

A gland on the front (ventral surface) of the vertebrae was caseous throughout.

Two ventral mediastinal glands were enlarged and diffusely caseous.

Abdomen.

Omentum.—The omentum was somewhat retracted, containing moderately numerous grey tubercles and nodules, caseous in the centre, varying up to a pea in size, but the majority smaller.

Intestines.—Normal.

Mesenteric Glands.—Normal.

Colic Glands.—Normal.

Spleen.—The spleen was slightly adherent in three places to the parietes; it measured 10 by 6 by 2·7 cm. On the surface there were several fibrous adhesions, under one of which was a projecting nodule. On section the substance consisted of firm red tissue in which were embedded three irregular nodules up to 1·5 cm. in greatest length; they were caseous and softening in the centre. In addition there were some sparsely scattered tubercles up to a hemp-seed in size.

Splenic Glands.—In one splenic gland there was a soft caseous nodule.

Liver.—Scattered throughout the liver, rather sparsely in places, were discrete caseous nodules with grey margins, the largest from 3 to 5 mm. in diameter, and also grey tubercles with opaque centres varying from a point up to a millet-seed in size.

Portal Glands.—The portal glands showed no opacities.

Kidneys.—The kidneys were pale and firm ; the left showed only a grey nodule, caseous in the centre, projecting slightly from the surface and 3 mm. in diameter.

Suprarenal Bodies.—Normal.

Lumbar Glands.—Normal.

Iliac Glands.—Normal.

Inguinal Glands.—Normal.

Larynx, Pharynx, Trachea and Tonsils.—Normal.

Microscopical Examinations.

(Smear preparations.)

Emulsion of Lung.—Moderately numerous tubercle bacilli.

Emulsion of Sternal Gland.—Very numerous tubercle bacilli.

Emulsion of Diaphragm (nodule).—A moderate number of tubercle bacilli.

BABOON 76 (Adult). Virus B. IV.

Subcutaneous inoculation of culture derived from the bronchial gland of Chimpanzee 22.

Dose—0·00001 milligramme.

Date of Inoculation—November 21, 1906.

Died—February 18, 1907. [89 days after inoculation.]

Clinical History.

At the seat of inoculation, 31 days after inoculation, there was a pea-sized thickening ; the adjacent glands were normal. This increased up to a pigeon's egg in size and burst, discharging pus. The axillary glands adjacent became enlarged, and the skin over them ulcerated. The general health remained good until about February 10, 1907, eight days before death, when the animal became quiet, with anxious expression, and refused its food.

Temperature.

The temperature was irregular, but remained below 39° C. until a month after inoculation. It then began to rise, and remained high for a month, highest point 39·9° C. Subsequently there was a fall corresponding with the period when the animal's health began to fail, and again a rise to 39·8° C. just before death.

Tuberculin Test.

February 8, 1907. [79 days after the experiment began.] Dose of tuberculin 0·5 cc. (bovine). No reaction.

POST-MORTEM EXAMINATION.

Local Lesion.—In the subcutaneous tissues of the back to the left side of mid line opposite the spinous process of the scapulae, there was a somewhat flattened tumour 4 by 2·5 cm. with six small ulcers from which purulent matter could be expressed ; it was not adherent to the muscle and did not infiltrate it. On section it consisted of a flattened cyst filled with caseo-pus with rough walls of pinkish-grey tissue and caseous nodules, with caseous substance adherent internally.

Axillary Glands.—At the anterior fold of the left axilla there was an ulcer 1·0 cm. in diameter with everted cicatricial margins leading into a deep cavity. In the left axilla there was a mass of glands adherent to the skin and muscle. At the side of the ulcer there was a sinus lined by granulation tissue leading down to the largest mass the size of a partridge's egg adherent to muscle, which contained two tubercles ; four glands could be made out, three of which were entirely replaced by softening caseous substance ; the fourth was partly caseous.

In the right axilla there was a mass 4 by 3 cm. adherent to the skin, but not ulcerating. On section the main part consisted of caseo-pus with a fibroid capsule, three smaller glands of which one was partly caseated.

At the apex of the right axilla were numerous small glands, the majority of which were normal ; a few contained caseous foci.

The left axilla was similar.

Inguinal Glands.—Normal.

Cervical Glands.—In the left cervical region beneath the sterno-mastoid muscle there were six glands, three with caseo-purulent nodules, three normal.

In the left posterior triangle there was a mass of adherent glands completely replaced by softening caseous substance.

In the right cervical region and posterior triangle the corresponding glands were quite small and normal in appearance.

Parotid Glands.—Normal.

Submaxillary Glands.—Normal.

Posterior-pharyngeal Glands.—Normal.

Thorax.

Lungs.—The anterior margin of the lung was adherent to the sternum.

The lungs filled the pleural cavities and the posterior lobes were firm, congested and oedematous. They showed on the surfaces rather sparsely scattered tubercles varying in size from a rape-seed up to a nodule the size of a small pea. The smallest tubercles were grey with caseous centres ; the largest were irregular nodules of reddish-grey tissue surrounding a caseous centre. On section there was the same sparse distribution of similar nodules. The substance of the lung was extremely oedematous, and presented a mottled appearance from numerous minute foci of congestion.

Bronchial Glands.—In a right bronchial gland there was a single caseous miliary tubercle, and an opaque focus in the left.

Mediastinal Glands.—One dorsal mediastinal gland was enlarged and caseous.

Three ventral mediastinal glands were enlarged, caseous, and softened.

The trachea and right bronchus contained red clots.

Abdomen.

Omentum.—On opening the peritoneal cavity the omentum was slightly adherent to the abdominal wall and more firmly down in the pelvis ; it was filled with numerous grey nodules considerably caseated, which in many parts were confluent, forming cord-like thickenings especially at the splenic end.

The parietal peritoneum showed numerous somewhat flattened grey tubercles with opaque centres.

On the mesentery and the meso-colon there were sparsely scattered tubercles.

Diaphragm.—The diaphragm showed flattened grey nodules caseous in the centre.

Intestines.—Normal.

Mesenteric Glands.—Normal.

Spleen.—The spleen was enlarged and irregular, measuring 10 by 5 cm. in greatest diameter ; the surface was made irregular by large projecting nodules, which were evidently tense cysts ; they varied in size from a milletseed up to 1·2 cm. in diameter. On section these nodules were composed of yellow caseo-purulent substance and were not surrounded by any definite capsule.

Liver.—On the surface of the liver beneath the capsule were numerous tubercles, the majority minute and grey with slight central opacities , the rest varied in size up to a hemp-seed ; the largest were entirely caseous and irregular in shape, some projecting slightly on the surface. On section through the substance of the liver the tubercles were similar in type but more sparsely distributed.

Portal Glands.—A portal gland the size of a sparrow's egg was soft and caseous throughout. A smaller one contained discrete tubercles.

Kidneys.—Normal.

Suprarenal Bodies.—In the right suprarenal body in the medulla there was a flattened calcareous body 6 mm. in length.

Left Suprarenal Body.—Normal.

Lumbar Glands.—In several of the lumbar glands there were a few discrete caseous tubercles the size of rape seed numerous in one small gland.

Iliac Glands.—Normal.

Pyloric Glands.—Three pyloric glands were enlarged and partly caseous.

Microscopical Examinations.

(Smear preparations.)

Lung (Emulsion of).—One tubercle bacillus seen.

Spleen (Emulsion of).—No tubercle bacilli seen.

BABOON 70. Virus B. I.

Subcutaneous inoculation of culture derived from the lung of Baboon 64.

Dose—0·0001 milligramme.

Date of Inoculation—November 29, 1906.

Died—March 26, 1907. [117 days after inoculation.]

Temperature.

The temperature was raised for a period of 29 days, from the 25th to the 54th day after inoculation, the highest point reached being 39·6° C. Before and after this period the temperature was about normal.

Tuberculin Test.

February 8, 1907. [71 days after the experiment began.] Dose of tuberculin, 0·5 cc. (bovine). Rise of temperature, 1·0° C.

POST-MORTEM EXAMINATION.

Local Lesion.—In the subcutaneous tissues of the back to the left of the middle line there was a flattened cavity 2·5 by 4 cm.; it was lined by a thin smooth layer of grey granulation tissue beneath which were a few caseous foci. It communicated externally by an irregular ulcer with thin indolent margins 2 by 1·2 cm. from which was discharging serous fluid. It was connected to the left axillary glands by a caseous cord.

Axillary Glands.—In the left axilla extending from apex to floor there was a chain of ten glands adherent to each other but surrounded by their own capsules; they varied in size from a pea up to a mass 4 or 5 by 2·2 by 1·5 cm. They were adherent to the skin of axilla in which there was a discharging sinus, and on section they were almost entirely replaced by softening yellow caseous tissue.

The right axillary glands showed no caseation.

Inguinal Glands.—Normal.

Cervical Glands.—Normal.

Submaxillary Glands.—Normal.

Posterior-pharyngeal Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—The lungs were somewhat congested and oedematous, and they contained in each nine to twelve large projecting nodules which consisted of central caseous tissue with a thin margin of grey tissue around. In addition to the larger nodules there were sparsely scattered grey tubercles with caseous centres.

Bronchial Glands.—Of the bronchial glands on the left side, two showed a few discrete caseous tubercles; the rest were normal. On the right side there was a single pea-sized caseous nodule in one gland and opaque foci in two others.

On the left side of the spinal column beneath the pleura at the level of the 5th and 6th ribs there was a caseous nodule, and a gland in each interspace showed a caseous tubercle.

Diaphragm.—In the substance of the diaphragm there were scattered caseous nodules, the pleural surface appearing normal except for a small adhesion to the lung.

Heart.—Normal.

Abdomen.

Intestines.—Normal.

Mesenteric Glands.—One mesenteric gland contained a soft caseous nodule; the rest and the colic glands were normal.

Peritoneum.—The parietal peritoneum was covered with numerous somewhat flattened translucent tubercles opaque in the centre. They were less numerous on the mesentery and intestines but very numerous on the diaphragm, especially where it was in contact with the liver.

Omentum.—The greater part of the omentum was rolled up and adherent to the spleen; it was retracted and thickened by numerous nodules, of which the smallest were minute and translucent and the largest the size of peas and caseous throughout.

Spleen.—The spleen was large measuring 13 by 6 by 4 cm. The surface was made irregular from projecting nodules which attained a large size up to 3 by 2 by 2 cm. On section through the spleen these nodules extended throughout the substance; they were closely placed and almost entirely replaced the splenic tissue. They consisted of soft yellow caseous substance breaking down and becoming puriform in the centre.

Liver.—The liver was adherent in several places to the diaphragm and the surface was covered with numerous flattened grey tubercles. Beneath the capsule there were several projecting nodules and there could be seen moderately numerous tubercles varying from a grey point up to a caseous nodule the size of a hempseed. On section through the substance there was a similar fairly close distribution of tubercles, the majority minute and grey with opaque centres, the largest irregular and caseous throughout.

Portal Glands.—The largest, the size of a pea, was about half caseous; a smaller gland contained discrete tubercles.

Kidneys.—In the superficial part of the cortex of the left kidney there were two minute grey tubercles and one similar tubercle in the right. On section two more were seen in the cortex of the left only.

Suprarenal Bodies.—Normal.

At the pillars of the diaphragm there were two glands (Coeliac) the size of a robin's egg and caseous throughout.

Lumbar and Iliac Glands.—Some showed a few caseous foci others were normal.

Tongue, Tonsils, Larynx, Pharynx and Trachea.—Normal.

Microscopical Examinations.

(Smear preparations.)

Lung.—No tubercle bacilli.

Spleen.—No tubercle bacilli.

Axillary Gland (2 smears).—No tubercle bacilli.

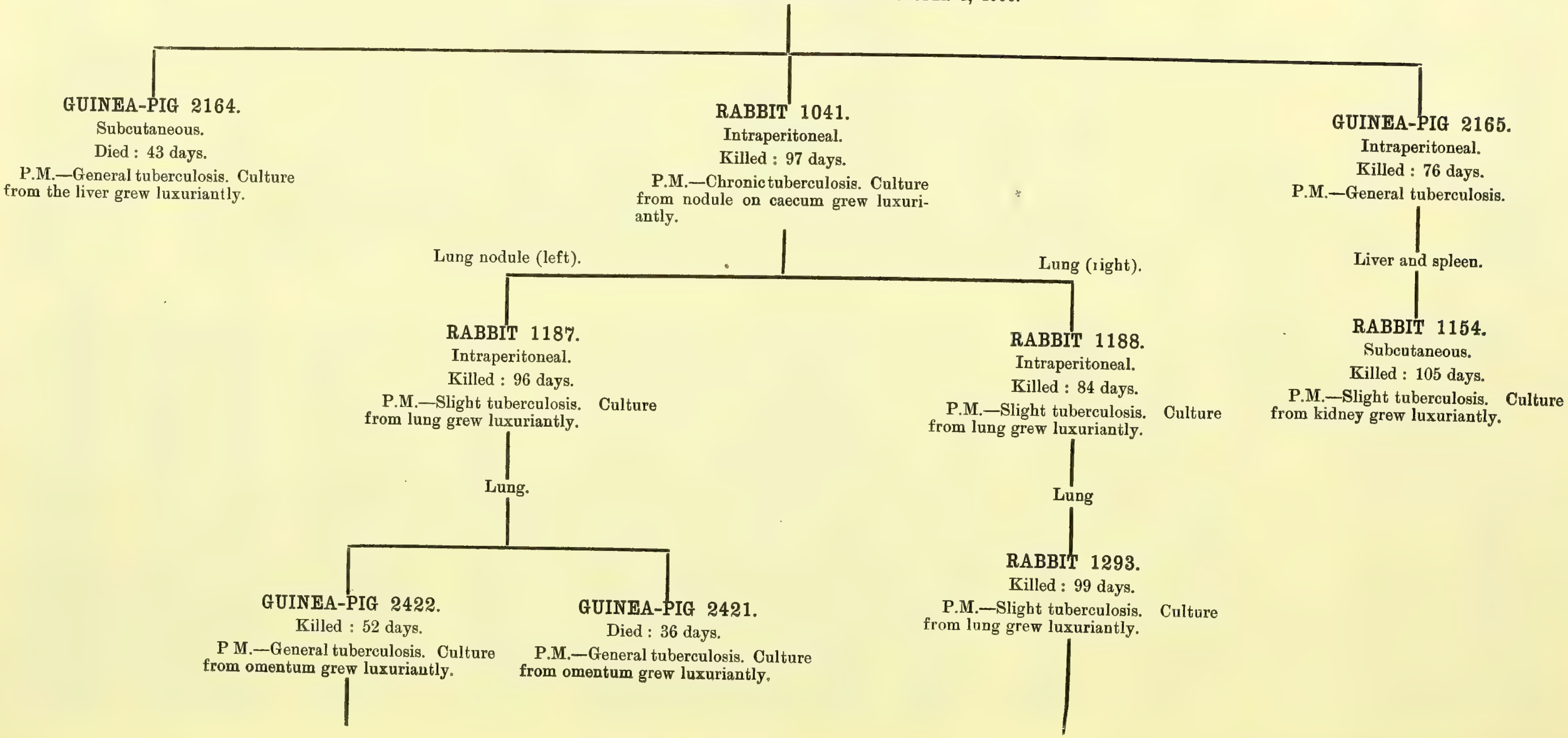
Mesenteric Gland.—Showed a moderate number of tubercle bacilli.

PASSAGE EXPERIMENTS WITH TUBERCLE BACILLI OF SLIGHT VIRULENCE FOR THE CALF AND RABBIT.

VIRUS Z. III. (Lung of an Antelope.)

No. 1.

INOCULATION OF ORIGINAL MATERIAL. OCTOBER 4, 1906.



GUINEA-PIG 2164.
Subcutaneous.
Died : 43 days.
P.M.—General tuberculosis. Culture from the liver grew luxuriantly.

RABBIT 1041.
Intraperitoneal.
Killed : 97 days.
P.M.—Chronic tuberculosis. Culture from nodule on caecum grew luxuriantly.

GUINEA-PIG 2165.
Intraperitoneal.
Killed : 76 days.
P.M.—General tuberculosis.

Lung nodule (left).

Lung (right).

Liver and spleen.

RABBIT 1187.
Intraperitoneal.
Killed : 96 days.
P.M.—Slight tuberculosis. Culture from lung grew luxuriantly.

RABBIT 1188.
Intraperitoneal.
Killed : 84 days.
P.M.—Slight tuberculosis. Culture from lung grew luxuriantly.

RABBIT 1154.
Subcutaneous.
Killed : 105 days.
P.M.—Slight tuberculosis. Culture from kidney grew luxuriantly.

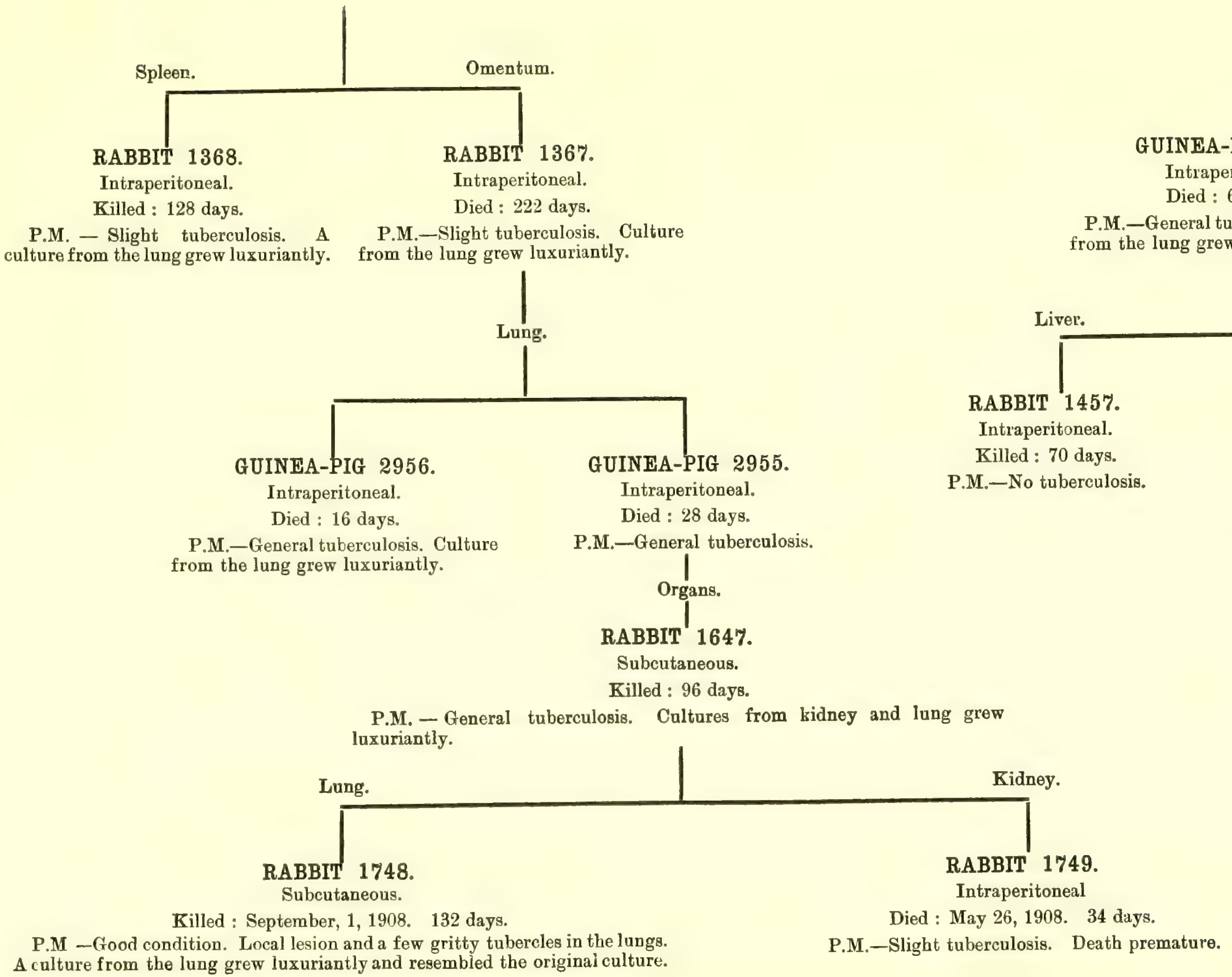
Lung.

Lung

GUINEA-PIG 2422.
Killed : 52 days.
P M.—General tuberculosis. Culture from omentum grew luxuriantly.

GUINEA-PIG 2421.
Died : 36 days.
P.M.—General tuberculosis. Culture from omentum grew luxuriantly.

RABBIT 1293.
Killed : 99 days.
P.M.—Slight tuberculosis. Culture from lung grew luxuriantly.



RABBIT 1368.
Intraperitoneal.
Killed : 128 days.
P.M. — Slight tuberculosis. A culture from the lung grew luxuriantly.

RABBIT 1367.
Intraperitoneal.
Died : 222 days.
P.M.—Slight tuberculosis. Culture from the lung grew luxuriantly.

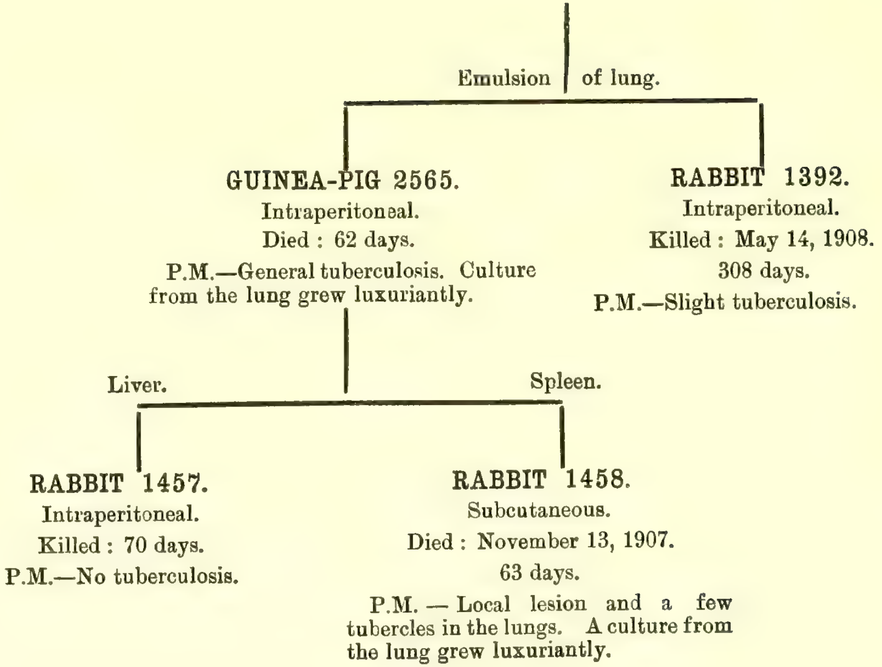
GUINEA-PIG 2956.
Intraperitoneal.
Died : 16 days.
P.M.—General tuberculosis. Culture from the lung grew luxuriantly.

GUINEA-PIG 2955.
Intraperitoneal.
Died : 28 days.
P.M.—General tuberculosis.

RABBIT 1647.
Subcutaneous.
Killed : 96 days.
P.M. — General tuberculosis. Cultures from kidney and lung grew luxuriantly.

RABBIT 1748.
Subcutaneous.
Killed : September, 1, 1908. 132 days.
P.M —Good condition. Local lesion and a few gritty tubercles in the lungs. A culture from the lung grew luxuriantly and resembled the original culture.

RABBIT 1749.
Intraperitoneal
Died : May 26, 1908. 34 days.
P.M.—Slight tuberculosis. Death premature.



GUINEA-PIG 2565.
Intraperitoneal.
Died : 62 days.
P.M.—General tuberculosis. Culture from the lung grew luxuriantly.

RABBIT 1392.
Intraperitoneal.
Killed : May 14, 1908.
308 days.
P.M.—Slight tuberculosis.

RABBIT 1457.
Intraperitoneal.
Killed : 70 days.
P.M.—No tuberculosis.

RABBIT 1458.
Subcutaneous.
Died : November 13, 1907.
63 days.
P.M. — Local lesion and a few tubercles in the lungs. A culture from the lung grew luxuriantly.

PASSAGE EXPERIMENTS WITH TUBERCLE BACILLI OF SLIGHT VIRULENCE FOR THE CALF AND RABBIT—*continued.*

VIRUS Z. III. (Lung of an Antelope)—*continued.*

No. 2.

CULTURE FROM THE ORIGINAL MATERIAL.

22 days old. 8th generation.

FEBRUARY 7, 1907.

RABBIT 1241.
Fed. 50·0 mg.
Killed : 245 days.

P.M.—A few caseous gritty marginal nodules in the lungs. No intestinal or mesenteric gland disease. Culture from lung grew luxuriantly.

Lung nodules.

GUINEA-PIG 2733.
Intraperitoneal.
Died : 40 days.

P.M.—General tuberculosis. A culture from the liver grew luxuriantly.

No. 3.

CULTURE FROM THE ORIGINAL MATERIAL OF VIRUS Z. III.

21 days old. 6th generation.

JANUARY 2, 1907.

RABBIT 1168.
Intraperitoneal. 1·0 mg.
Killed : 391 days.

P.M.—Chronic general tuberculosis. A culture from the lung grew luxuriantly.

Vesicula Seminalis.

RABBIT 1610.
Intraperitoneal.
Killed : 84 days.

P.M.—Chronic general tuberculosis.

Testis.

RABBIT 1611.
Killed : 217 days.

P.M.—Chronic tuberculosis. A culture from the lung grew luxuriantly.

Lung.

RABBIT 1746.
Subcutaneous.
Killed : 132 days.

P.M.—Chronic general tuberculosis. A culture from the lung grew luxuriantly, resembling the original culture.

Kidney.

RABBIT 1747.
Intraperitoneal.
Killed : 44 days.

P.M.—Early general tuberculosis

VIRUS P. IV. (Submaxillary Gland of a Pig.)

CULTURE FROM THE ORIGINAL MATERIAL.

The culture used was the 11th generation, 21 days old, and had been in artificial cultivation a total period of 183 days.

SEPTEMBER 20, 1905.

CALF 350.
Subcutaneous.
Dose : 50·0 mg.
Killed : December 19, 1905.
90 days.

P.M.—Local tuberculosis. A tubercle in a coeliac gland and one in the lung.

Culture from the prescapular gland.

RABBIT 1295.
Intraperitoneal.
Dose : 1·0 mg.
Killed (ill) : June 29, 1907.
81 days.

P.M.—Chronic general tuberculosis. Cultures from lung and kidney unchanged.

Emulsion of lung.

RABBIT 1379.
Subcutaneous.
Killed : October 10, 1907.
101 days.

P.M.—Local lesion and twelve gritty caseous nodules in the lungs.

Emulsion of lung nodules.

GUINEA-PIG 2731.
Intraperitoneal.
Died : November 25, 1907.
46 days.

P.M.—General tuberculosis. Culture from spleen unchanged.

Emulsion of liver.

RABBIT 1551.
Intraperitoneal.
Died : March 7, 1908.
102 days.

P.M. — Chronic general tuberculosis. This final culture was identical with the original culture of Virus P. IV.

RABBIT 1294.
Subcutaneous.
Dose : 25·0 mg.
Killed : November 25, 1907.
230 days.

P.M.—Local lesion. A tubercle in the lung and a kidney. No disease elsewhere. Culture from local lesion unchanged.

PASSAGE EXPERIMENTS WITH TUBERCLE BACILLI OF SLIGHT VIRULENCE FOR THE CALF AND RABBIT—*continued.*

VIRUS P IV. (Submaxillary Gland of a Pig)—*continued.*

CALF PASSAGE EXPERIMENT.

CULTURE INOCULATION. July 19, 1905.

The strain was derived from the original material, and had been in cultivation a total period of 120 days.

The culture used was the 7th generation, 20 days old.

CALF 312.
Subcutaneous.
Dose : 50 mg.
Killed : October 17, 1905.
90 days.

P.M.—Local tumour and caseation of prescapular gland. Tubercle and solid patches in the lungs ; scattered tubercles in the lymph glands and suprarenal bodies.

CULTURE.
December 4, 1905.

The strain was derived from the lung, and had been in cultivation a total period of 4½ months. The culture used was the 4th generation, 20 days old.

RABBITS.

Number.	Method.	Dose.	Duration of Life.	Result.
555	Intrav.	1·0 mg.	D. 88 days	G. T.
556	Intrap.	1·0 mg.	K. 276 „	Chronic G. T.
557	Subcut.	50·0 mg.	D. 149 „	G. T. not severe.

Culture from Rabbit 556.

Number.	Method.	Dose.	Duration of Life.	Result.
1263	Subcut.	1·0 mg.	D. 49 days	G. T.
1264	Subcut.	10·0 mg.	D. 11 „	Local T.
1265	Intrav.	0·1 mg.	D. 14 „	G. T.
1266	Intrap.	1·0 mg.	D. 11 „	Early G. T.

Culture from Rabbit 557.

Number.	Method.	Dose.	Duration of Life.	Result.
1267	Intrav.	0·1 mg.	D. 17 days	G. T.
1268	Intrap.	1·0 mg.	D. 6 „	Perit. T.
1269	Subcut.	1·0 mg.	D. 33 „	G. T.
1270	Subcut.	10·0 mg.	D. 19 „	G. T.

CALF 358.
Subcutaneous.
Dose : 50 mg.
Killed : March 7, 1906.
93 days.

P.M.—Local abscess. Caseous nodule in prescapular gland.

CULTURE.
June 1, 1906.

The strain was derived from the prescapular gland, and had been in cultivation a total period of three months. The culture used was the 5th generation, 21 days old.

CALF 426.
Intramuscular.
Dose : 200 mg.
Died : June 30, 1906.
29 days.

P.M.—Caseous local tumour and caseation of adjacent glands. Minute tubercles in the lungs and liver.

CALF 356.
Subcutaneous.
Dose : 50 mg.
Killed : March 19, 1906.
105 days.

P.M.—Cystic local lesion and caseo-calcareous tubercles in the prescapular gland.

CALF 314.
Subcutaneous.
Dose : 50 mg.
Killed : December 1, 1905.
135 days.

P.M.—Cystic local lesion and caseo-calcareous prescapular gland.

LIST OF ANIMALS INOCULATED WITH SLIGHTLY VIRULENT TUBERCLE BACILLI, FROM WHICH CULTURES WERE RECOVERED.

Virus.	Material Inoculated.	Number of Animal.	Date of Inoculation.	Duration of Life.	Dose and Method of Inoculation.	Result.
P. XLI.	Culture from the original material.	Calf 478	November 15, 1906	Killed 99 days	50·0 mg. Subcutaneous.	Local tuberculosis only. Culture was unchanged.
,,	,,	Calf 480	November 15, 1906	Killed 98 days	100·0 mg. Subcutaneous.	Local tuberculosis and a few tubercles in the liver. Culture was unchanged.
Z. III.	Culture from the original material.	Calf 510	February 7, 1907	Killed 96 days	50·0 mg. Subcutaneous.	Local tuberculosis only. Culture from an inferior cervical gland was unchanged.
,,	,,	Calf 516	February 7, 1907	Killed 123 days	50·0 mg. Subcutaneous.	Local tuberculosis and a focus in a mesenteric and a submaxillary gland. A culture from the cervical gland was unchanged.
P. XLI.	Culture from the original material.	Pig 166	January 25, 1907	Killed 102 days	50·0 mg. Subcutaneous.	Local tuberculosis and tuberculous consolidation of the lungs. A tubercle in the spleen and a suprarenal body. Yellowish grey nodules in the kidneys. A culture from the lung was unchanged.
P. XLVI.	Culture from the original material.	Pig 164	January 25, 1907	Killed 97 days	50·0 mg. Subcutaneous.	Local tuberculosis and a few foci in the lungs.
,,	,,	Pig 168	January 25, 1907	Killed 60 days	50·0 mg. Fed.	Slight tuberculosis of submaxillary, mesenteric and colic glands. In the lungs there were six translucent tubercles.
Z. III.	Culture from the original material.	Pig 174	February 8, 1907	Died 111 days	50·0 mg. Subcutaneous.	Local tuberculosis only. A culture from the precrural gland was unchanged.
P. IV.	Culture from the original material.	Rabbit 314.	June 5, 1905	Died 333 days	0·1 mg. Intraperitoneal.	Severe chronic general tuberculosis. A culture from the omentum was unchanged.
,,	Emulsion of liver of Guinea-pig 2731.	Rabbit 1551.	November 26, 1907	Died 102 days	Intraperitoneal	Chronic general tuberculosis. Numerous grey nodules in the cortices of the kidneys and caseo-purulent streaks in the pyramids. Numerous caseous patches on the surfaces and in the margins of the lungs. A culture from the omentum was unchanged.
Z. III.	Culture from the original material.	Rabbit 1239.	February 7, 1907	Died 95 days	10·0 mg. Intraperitoneal.	Chronic general tuberculosis. Kidneys and lungs severely affected. Cultures from the omentum and lung were unchanged.
,,	,,	Rabbit 1166.	January 2, 1907	Died 74 days	0·1 mg. Intravenous.	General tuberculosis, severe in the lungs. A culture from the lung was unchanged.
,,	,,	Rabbit 1168.	January 2, 1907	Killed 391 days	1·0 mg. Intraperitoneal.	Chronic general tuberculosis. Testis and vas deferens on each side greatly enlarged and replaced by caseous substance. Cystic nodules and softening caseous nodules in the lungs. A culture from the lung was unchanged.
,,	,,	Rabbit 1170.	January 2, 1907	Died 93 days	10·0 mg. Subcutaneous.	Slight generalised tuberculosis. A culture from the lung was unchanged.
,,	,,	Rabbit 1172.	January 2, 1907	Killed 111 days	50·0 mg. Subcutaneous.	Slight generalised tuberculosis. Cultures from the lung were unchanged.

RABBITS INOCULATED WITH CULTURES OF BOVINE TUBERCLE BACILLI GROWN ON SERUM AND GLYCERIN SERUM RESPECTIVELY.

VIRUS B. IV.

Total duration of artificial cultivation—1,487 days.

Serum Culture. 36th Generation. 20 days old.

Number.	Date of Inoculation.	Dose.	Method of Inoculation.	Duration of Life.	Result.
1560	December 3, 1907	0·1 mg.	Intravenous.	Died 25 days	G. T.
1561		0·1 mg.	,,	Died 22 days	G. T.
1562		0·01 mg.	,,	Died 31 days	G. T.
1563		0·01 mg.	,,	Died 27 days	G. T.
1571		0·01 mg.	,,	Died 32 days	G. T.
1559		10·0 mg.	Subcutaneous	Died 37 days	G. T.
1564		10·0 mg.	,,	Died 30 days	G. T.

Glycerin Serum Culture. 43rd Generation of which 24 were on Glycerin Serum. 20 days old.

Number.	Date of Inoculation.	Dose.	Method of Inoculation.	Duration of Life.	Result.
1565	December 3, 1907	0·1 mg.	Intravenous	Died 23 days	G. T.
1566		0·1 mg.	,,	Died 23 days	G. T.
1567		0·01 mg.	,,	Died 31 days	G. T.
1569		0·01 mg.	,,	Died 30 days	G. T
1568		10·0 mg.	Subcutaneous	Died 156 days	G. T.
1570		10·0 mg.	,,	Died 40 days	G. T.

VIRUS B. IX.

Total duration of artificial cultivation—1,244 days.

Serum Culture. 40th Generation. 20 days old.

1573	December 4, 1907	0·1 mg.	Intravenous	Died 21 days	G. T.
1576		0·1 mg.	,,	Died 20 days	G. T.
1572		0·01 mg.	,,	Died 27 days	G. T.
1577		0·01 mg.	,,	Died 31 days	G. T.
1574		10·0 mg.	Subcutaneous	Died 40 days	G. T.
1575		10·0 mg.	,,	Died 52 days	G. T.

Glycerin Serum Culture. 38th Generation of which 22 were on Glycerin Serum. 20 days old.

1578	December 4, 1907	0·1 mg.	Intravenous	Died 26 days	G. T.
1579		0·1 mg.	,,	Died 31 days	G. T.
1580		0·01 mg.	,,	Died 42 days	G. T.
1582		0·01 mg.	,,	Died 38 days	G. T.
1581		10·0 mg.	Subcutaneous	Died 150 days	G. T.
1583		10·0 mg.	,,	Died 46 days	G. T.

RABBITS INOCULATED WITH CULTURES OF BOVINE TUBERCLE BACILLI GROWN ON SERUM AND GLYCERIN SERUM RESPECTIVELY—*continued.*

VIRUS B. XI.

Total duration of artificial cultivation—1,189 days.

Serum Culture. 29th Generation. 20 days old.						Glycerin Serum Culture. 40th Generation of which 25 were on Glycerin Serum. 20 days old.					
Number.	Date of Inoculation.	Dose.	Method of Inoculation.	Duration of Life.	Result.	Number.	Date of Inoculation.	Dose.	Method of Inoculation.	Duration of Life.	Result.
1584	December 10, 1907	0·1 mg.	Intravenous	Died 18 days	G. T.	1590	December 10, 1907	0·1 mg.	Intravenous	Died 24 days	G. T.
1585		0·1 mg.	,,	Died 22 days	G. T.	1594		0·1 mg.	..	Died 25 days	G. T.
1588		0·01 mg.	..	Died 24 days	G. T.	1591		0·01 mg.	..	Died 7 days	? Cause of death.
1589		0·01 mg.	,,	Died 30 days	G. T.	1593		0·01 mg.	..	Died 7 days	? Cause of death.
1586		10·0 mg.	Subcutaneous	Died 32 days	G. T.	1592		10·0 mg.	Subcutaneous	Died 64 days	G. T.
1587		10·0 mg.	..	Killed 64 days	G. T.	1595		10·0 mg.	..	Died 12 days	Death due to septic wounds.

INVESTIGATION OF ARTIFICIALLY MIXED CULTURES.

BY

F. GRIFFITH, M.B.

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INVESTIGATION OF ARTIFICIALLY MIXED CULTURES.

On Calves.

In view of the possibility of meeting with mixed infections in the investigation of tuberculosis in man it was considered desirable to determine what takes place in the body of a calf after the inoculation of a mixture of cultures possessing different degrees of virulence. Two cultures were chosen whose properties and characters had been fully worked out. Of these, the one (H. 56 F.T.) derived from a case of phthisis in man was easy growing and slightly virulent for calves and rabbits; the other (B. XXVI.), isolated from an ox, grew poorly and was fully virulent.

With a mixture of these cultures two calves were inoculated subcutaneously, each receiving ·02 mg. of the virulent virus and 50 mg. of the slightly virulent virus. This mixed culture grew readily on artificial media, exhibiting the cultural characters of the slightly virulent element, while the results of the inoculations showed it possessed the virulence of the bovine element. In fact, the presence of the slightly virulent bacillus in no way diminished the effectiveness of the bovine tubercle bacillus, since one of the two calves (Calf 460) died of general tuberculosis in 113 days, an exceptionally severe result from the subcutaneous inoculation of so small a dose of culture as ·02 mg.

The second calf (Calf 462) was killed after a period of 59 days, and showed in addition to the local lesion and tuberculosis of the nearest glands only slight disseminated tuberculosis. From the prescapular gland of this animal an emulsion was made and inoculated subcutaneously into another calf (Calf 468, the second in the series) which died of general tuberculosis in 79 days. Two more calves (Calves 472 and 470, the third in the series) were inoculated, one from the spleen, the other from the prescapular gland of the preceding calf. They were killed 152 and 150 days later and showed chronic general tuberculosis.

From the lesions in all these calves cultures were isolated both directly and through guinea-pigs and rabbits, the main purpose of the experiment being to ascertain whether these cultures resembled the mixed culture or exhibited the characters of either one or other of the component parts of the mixture.

The characters of the cultures were determined in the usual way from the comparison of the growths obtained on the various differential media:—Serum, serum with the addition of glycerin, glycerin broth, glycerin agar and glycerinated potato.

The result of the cultural investigation was to establish that every culture isolated, even those from the prescapular glands, exhibited the distinctive characters of the bovine element of the mixture and in none was there any evidence of the presence of the easy growing human tubercle bacillus.

On Rabbits.

At the same time as the calves, a rabbit (No. 925) was inoculated subcutaneously with an equivalent dose of the mixture. It was killed after 58 days and showed general progressive tuberculosis. From the tuberculous lesions in the lung, spleen and kidney cultures were isolated; the culture from the lung grew luxuriantly, resembling the slightly virulent bacillus, and when tested in rabbits was found to be virulent, that is to say, it possessed the characters and virulence of the original mixture; the cultures from the spleen and kidney grew poorly and were identical with the bovine element of the mixture. The mixed culture grown from the lung was, as stated above, tested by inoculation into rabbits and from the lung of the rabbit subcutaneously inoculated (No. 1162), a culture was isolated which was identical with the bovine tubercle bacillus.

As will be seen from reference to the chart, two series of passage experiments in rabbits with emulsions of tuberculous tissue were made, beginning with the lung of Rabbit 925, from which the mixed culture was obtained. All the rabbits in these series developed general tuberculosis, and the cultures isolated from different sites were typically bovine in character.

A rabbit (No. 926) inoculated subcutaneously with the original mixture, the dose being ·02 mg. of Virus B. XXVI. and 20 mg. of Virus H. 56 F.T., died of an intercurrent disorder within 24 hours. Cultures were sown direct from the spleen and several discrete colonies developed. Two of these were subcultured separately and tested on the differential media; one grew poorly like the bovine bacillus, the other luxuriantly.

A guinea-pig inoculated with an emulsion of the spleen of the rabbit became tuberculous and the culture isolated grew luxuriantly.

This experiment shows that both the virulent and the slightly virulent bacillus were disseminated within 24 hours.

Summary.

The result of the experiment on the calf shows that if a calf is inoculated subcutaneously with a mixture of a slightly virulent culture and a virulent culture, it is possible to recover from the lesions produced cultures in which the virulent element can alone be demonstrated, even though in the original mixture the slightly virulent bacilli were in preponderating numbers. This elimination is demonstrable when, as in this case, there is a wide difference between the cultural characters of the two cultures. A similar result can be obtained though less quickly by means of the subcutaneous inoculation of rabbits.

In considering this result it is important to point out that in the test inoculations of calves with Virus H 56, the subcutaneous inoculation of 50 mg. of culture gave rise to only a few discrete nodules in the prescapular glands and no disseminated lesions. It is well known that the slightly virulent bacillus (Group II.) is disseminated over the body of the calf after subcutaneous inoculation and can retain its vitality in the tissues for more than 59 days. Therefore the fact that the presence of slightly virulent bacilli could not be demonstrated in any of the cultures isolated even in those from the prescapular glands cannot be taken as proof that the slightly virulent bacilli were completely eliminated. Their apparent disappearance may be explained on the assumption that the cultures were isolated from tuberculous tissue which owed its origin entirely to the action of the virulent bacilli and in which the latter would be present if not alone at any rate in superior numbers. On the other hand since tubercles are often found in the lung of a rabbit after the subcutaneous inoculation of a large dose of slightly virulent tubercle bacilli, it is easy to understand the isolation of a mixed culture from that organ, as occurred in the rabbit experiment.

The details of the experiments are represented graphically in the appended tables, in which all references to cultures are printed in italics. The terms dysgonic and eugonic have been used to denote briefly the characters of the virulent and the slightly virulent culture respectively.

F. Griffith.

EXPERIMENT ON CALVES WITH MIXED CULTURES OF VIRUS H. 56 F.T. AND VIRUS B XXVI.

June 26, 1906.

CALF 460.
Subcutaneous.
Dose: 50 mgs. Virus H. 56
+·02 mg. Virus B. XXVI.
Died: October 17th, 1906.
(113 days.)
P.M.—General tuberculosis.

Direct culture from Calf 460.

Source.	*Character.*
Mediastinal gland.	*Dysgonic.*

Material used.	Animal.	Duration of Life.	Result.	*Cultures.*	
				Source.	*Character.*
Prescapular gland.	G.-Pig 2169	Killed 42 days	G. T.	*Kidney* ...	*Dysgonic.*
	„ 2170	Died 22 „	G. T.	*Sternal gland* *Omentum* ...	*Dysgonic.* *Dysgonic.*
Portal gland.	„ 2167	Died 42 „	G. T.	*Omentum* ...	*Dysgonic.*
	„ 2168	Killed 42 „	G. T.	*No culture* ...	—

CALF 462.
Subcutaneous.
Dose: 50 mgs. Virus H. 56
+·02 mg. Virus B. XXVI.
Killed: August 24th, 1906.
(59 days.)

P.M.—Fibrous walled cyst, with caseo-purulent contents. Prescapular gland showed a few scattered yellow foci, mid cervical glands numerous small yellow tubercles. Lungs crepitant with sparsely scattered reddish nodules caseous in the centre, up to a hemp seed in size. Liver, kidneys, and spleen normal; yellow foci in bronchial and mediastinal glands. No tuberculosis elsewhere.

Direct cultures from Calf 462.

Source.	*Character.*
Prescap. gland No. I.	*Dysgonic.*
Prescap. gland No. II.	*Dysgonic.*
Mediast. gland No. I.	*Dysgonic.*
Mediast. gland No. II.	*Dysgonic.*
Mediast. gland No. III.	*Dysgonic*
Lung	*Dysgonic.*
Coeliac gland	*Dysgonic*

Material used.	Animal.	Duration of Life.	Result.	*Cultures.*	
				Source.	*Character.*
Prescapular gland.	Rabbit 1033	Died 52 days	G. T.	*Axillary gland* *Kidney* ...	*Dysgonic.* *Dysgonic.*
	„ 1034	Died 61 „	G. T.	*No culture* ...	—
	G.-Pig 2158	Killed 77 „	G. T.	*Inguinal gland* *Sternal gland*	— *Dysgonic.*
Cervical gland.	Rabbit 1035	Died 80 „	G. T.	*Kidney* ...	*Dysgonic.*
	G.-Pig 2160	Died 82 „	G. T.	*No culture* ...	—
Mediastinal gland.	Rabbit 1036	Died 87 „	G. T.	*No culture* ...	—
	„ 1037	Died 81 „	G. T.	*Local lesion* *Kidney* ...	*Dysgonic.* —
Spleen ...	G.-Pig 2159	Killed 90 „	Healthy	—	—

Prescapular gland.

CALF 468.
Subcutaneous.
Dose: 9·0 cubic centimetres.
Died: November 11th, 1906.
(79 days.)
P.M.—General tuberculosis.

Direct cultures from Calf 468.

Source.	*Character.*
Mediastinal gland ...	*Dysgonic.*
Bronchial gland ...	*Dysgonic.*
Portal gland	*Dysgonic.*
Liver	—

Spleen.

CALF 472.
Subcutaneous.
Dose: 9·0 cubic centimetres.
Killed: April 12th, 1907.
(152 days.)
P.M.—General tuberculosis.

Direct cultures from Calf 472.

Source.	*Character.*
Lung ...	*Dysgonic.*
Cervical gland	*Dysgonic.*
Mediastinal gland.	*Dysgonic.*
Prepectoral gland.	*Dysgonic.*

Material used.	Animal.	Duration of Life	Result.
Cervical gland.	Rabbit 1302	Killed 136 days	No tub.
	„ 1303	Died 91 „	G. T.

Prescapular gland.

CALF 470.
Subcutaneous.
Dose: 9·0 cubic centimetres.
Killed: April 10th, 1907.
(150 days.)
P.M.—General tuberculosis.

Direct cultures from Calf 470.

Source.	*Character.*
Lung	--
Liver	*Dysgonic.*
Portal gland	—
Bronchial gland ...	*Dysgonic.*

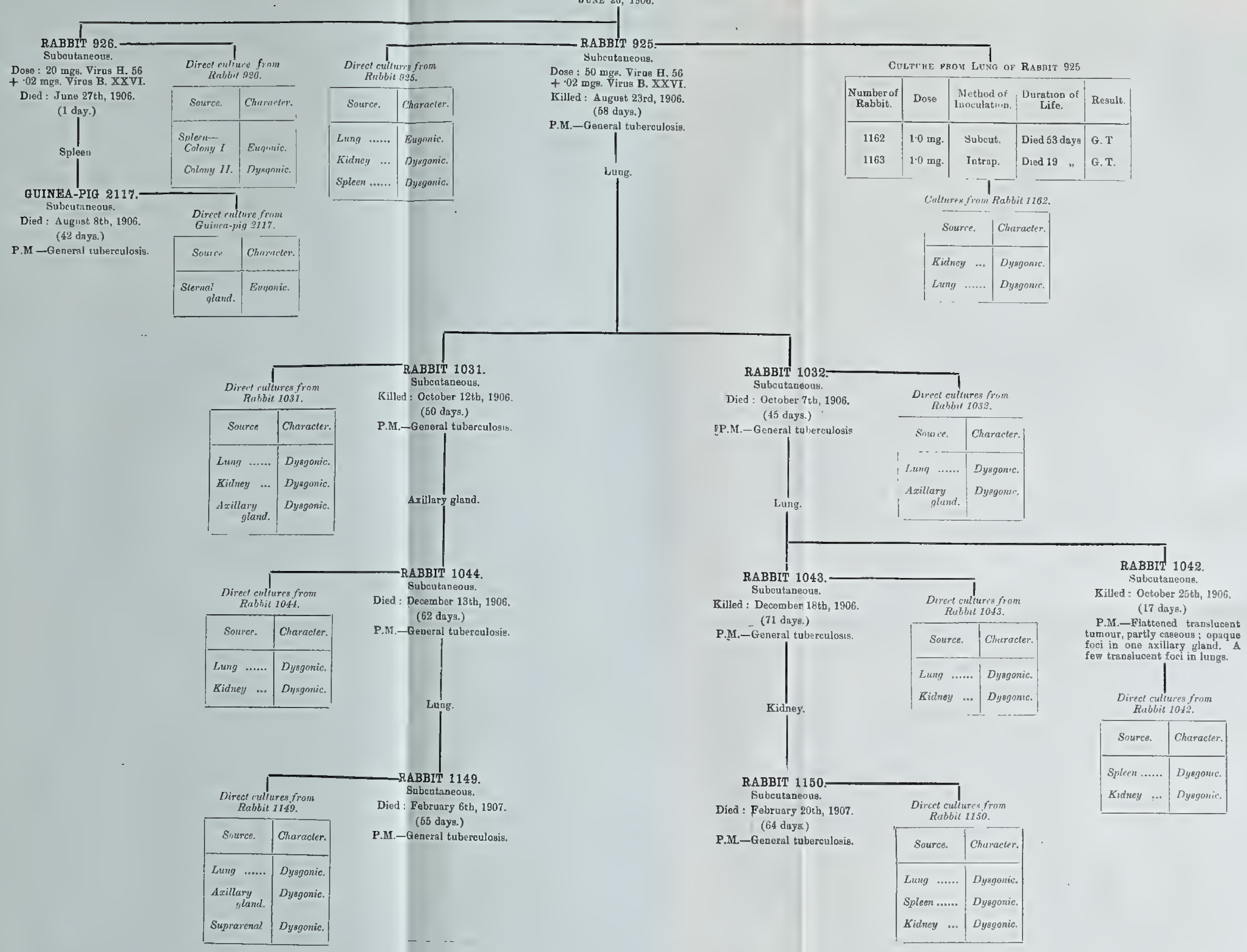
Material used.	Animal.	Duration of Life.	Result
Lung ...	Rabbit 1298	Died 77 days	G. T.
	„ 1299	„ 60 „	G. T.
Portal gland	„ 1300	Killed 138 „	G. T.
	„ 1301	Died 104 „	G. T.

Local lesion.

Animal.	Duration of Life.	Result.	*Cultures.*	
			Source.	*Character.*
G.-Pig 2187	Killed 18 days...	S. T.	*Omentum*	*Dysgonic.*
„ 2188	„ 64 „ ...	S. T.	*Omentum*	*Dysgonic.*

EXPERIMENT ON RABBITS WITH MIXED CULTURES OF VIRUS H. 56 F.T. AND VIRUS B. XXVI.

June 26, 1906.



RABBIT 926.
Subcutaneous.
Dose: 20 mgs. Virus H. 56
+ ·02 mgs. Virus B. XXVI.
Died: June 27th, 1906.
(1 day.)

Direct culture from Rabbit 926.

Source.	*Character.*
Spleen—Colony I	*Eugonic.*
Colony II.	*Dysgonic.*

Spleen

GUINEA-PIG 2117.
Subcutaneous.
Died: August 8th, 1906.
(42 days.)
P.M.—General tuberculosis.

Direct culture from Guinea-pig 2117.

Source.	*Character.*
Sternal gland.	*Eugonic.*

RABBIT 925.
Subcutaneous.
Dose: 50 mgs. Virus H. 56
+ ·02 mgs. Virus B. XXVI.
Killed: August 23rd, 1906.
(58 days.)
P.M.—General tuberculosis.

Direct cultures from Rabbit 925.

Source.	*Character.*
Lung	*Eugonic.*
Kidney ...	*Dysgonic.*
Spleen	*Dysgonic.*

Culture from Lung of Rabbit 925

Number of Rabbit.	Dose	Method of Inoculation.	Duration of Life.	Result.
1162	1·0 mg.	Subcut.	Died 53 days	G. T
1163	1·0 mg.	Intrap.	Died 19 „	G. T.

Cultures from Rabbit 1162.

Source.	*Character.*
Kidney ...	*Dysgonic.*
Lung	*Dysgonic.*

Lung.

RABBIT 1031.
Subcutaneous.
Killed: October 12th, 1906.
(50 days.)
P.M.—General tuberculosis.

Direct cultures from Rabbit 1031.

Source	*Character.*
Lung	*Dysgonic.*
Kidney ...	*Dysgonic.*
Axillary gland.	*Dysgonic.*

Axillary gland.

RABBIT 1044.
Subcutaneous.
Died: December 13th, 1906.
(62 days.)
P.M.—General tuberculosis.

Direct cultures from Rabbit 1044.

Source.	*Character.*
Lung	*Dysgonic.*
Kidney ...	*Dysgonic.*

Lung.

RABBIT 1149.
Subcutaneous.
Died: February 6th, 1907.
(55 days.)
P.M.—General tuberculosis.

Direct cultures from Rabbit 1149.

Source.	*Character.*
Lung	*Dysgonic.*
Axillary gland.	*Dysgonic.*
Suprarenal	*Dysgonic.*

RABBIT 1032.
Subcutaneous.
Died: October 7th, 1906.
(45 days.)
P.M.—General tuberculosis

Direct cultures from Rabbit 1032.

Source.	*Character.*
Lung	*Dysgonic.*
Axillary gland.	*Dysgonic.*

Lung.

RABBIT 1043.
Subcutaneous.
Killed: December 18th, 1906.
(71 days.)
P.M.—General tuberculosis.

Direct cultures from Rabbit 1043.

Source.	*Character.*
Lung	*Dysgonic.*
Kidney ...	*Dysgonic.*

Kidney.

RABBIT 1150.
Subcutaneous.
Died: February 20th, 1907.
(64 days.)
P.M.—General tuberculosis.

Direct cultures from Rabbit 1150.

Source.	*Character.*
Lung	*Dysgonic.*
Spleen	*Dysgonic.*
Kidney ...	*Dysgonic.*

RABBIT 1042.
Subcutaneous.
Killed: October 25th, 1906.
(17 days.)
P.M.—Flattened translucent tumour, partly caseous; opaque foci in one axillary gland. A few translucent foci in lungs.

Direct cultures from Rabbit 1042.

Source.	*Character.*
Spleen	*Dysgonic.*
Kidney ...	*Dysgonic.*

CALF 460.

Subcutaneous inoculation of mixed cultures derived from the original materials of Virus B. XXVI. and Virus H. 56 F.T.

Dose—50 milligrammes of Virus H. 56 and ·02 milligramme of Virus B. XXVI.

Date of Inoculation—June 26, 1906. [Age 8·5 weeks.]

Died—October 17, 1906. [113 days after inoculation.]

Weights.

	kilos.
June 26, 1906	59·54
October 17, 1906	52·27

Total loss in weight—7·27 kilos.

POST-MORTEM EXAMINATION.

Local Lesion.—In the subcutaneous tissues on the left side of the neck there was a pear-shaped prominent swelling 12·7 by 7 by 5·1 cm., weighing 227 grammes with skin and muscle to which it was adherent. On section the tumour was almost wholly cystic, containing curdy caseous masses in a clear serous fluid : the walls were formed by fibro-caseous gritty tissue lined by a softened caseous substance internally and varying from ·8 to 3 cm. in thickness.

Left Prescapular Gland.—The left prescapular gland measured 10·2 by 5 by 1 by 3 cm. The gland was firm, and on section the cortex, except for a small part at one extremity, was replaced by translucent tissue with a close caseous network studded with calcareous foci.

Right Prescapular Gland.—The right prescapular gland was congested ; the cortex was firm without any sign of caseation.

Prepectoral Glands.—The rounded left prepectoral gland was almost entirely replaced by necrotic substance resembling the left prescapular gland.

The left reniform prepectoral gland contained a caseo-calcareous nodule replacing three-quarters of the gland.

The right prepectoral glands were dark and a little firm.

Cervical Glands.—The left inferior cervical gland was large, firm, and almost entirely caseous with numerous calcareous foci. A middle and a left upper cervical gland contained discrete fibro-caseous nodules. The right inferior cervical gland resembled the left prepectoral glands. Other cervical glands on this side appeared normal.

The Axillary Glands appeared normal.

Thorax.

In the pleural cavities there was some clear yellowish fluid.

Pleura.—The lymphatic fringes of the pleura contained flattened fibroid tubercles up to 1·5 mm. in diameter ; they were more numerous and smaller on the diaphragm.

Lungs.—The lungs did not collapse normally. The left lung weighed 1·7 kilo. and the right lung 2·4 kilos. They just floated in water. The anterior and middle lobes and the anterior portions of the caudal lobes were firm and quite solid ; they contained numerous closely placed caseous nodules with calcareous centres and narrow grey margins measuring up to nearly 2 cm. in diameter. The lung substance in between was dark and airless, containing numerous grey foci and smaller caseous tubercles. In the posterior portions of the caudal lobes the nodules were more discrete and showed a great uniformity in size ; the lung substance in between was oedematous, but air-containing, and in it could be seen numerous grey foci.

Thoracic Lymphatic Glands. — The mediastinal glands were large and firm ; the long gland measured 12·7 by 5·1 by 3·8 cm. On section the gland substance was to a great extent replaced by translucent tissue with a close yellowish caseous network with more opaque yellow calcareous streaks. The other glands were similarly and even more extensively affected.

Two Ventral Mediastinal Glands were enlarged, congested, and contained numerous minute foci.

Bronchial Glands.—The bronchial glands on both sides were enlarged and very firm ; on section the gland substance was entirely replaced, closely resembling the anterior mediastinal glands.

The Pericardium and the ligament attaching it to the diaphragm were congested and showed moderately numerous minute grey tubercles ; on the inner surface of the pericardium there were patches containing numerous translucent foci surrounded by an area of congestion ; other patches were composed of groups of prominent tubercles.

On the aorta there were two loosely attached fibro-caseous growths.

Endocardium.—Normal.

Abdomen.

The Omentum and Peritoneum were normal.

Intestines.—The small intestine and the large intestine were slightly and irregularly congested.

Mesenteric Glands.—In an anterior mesenteric gland there was a pea-sized translucent nodule with a caseo-calcareous network.

Spleen.—The spleen weighed 212 grammes and contained two tubercles, which could be seen beneath the surface, the size of a millet seed and a hemp seed respectively ; they were yellowish and calcareous in the centre.

Liver.—On the surface of the liver and throughout the substance were sparsely scattered minute grey foci without any visible central caseation.

Gall Bladder.—Normal.

Portal Glands.—The portal glands were five in number and also showed discrete nodules up to 1·3 cm. in diameter ; they consisted of a margin of grey tissue, becoming more opaque towards the centre, where there were yellowish calcareous streaks.

Kidneys.—On the surface of the left kidney there were three minute grey tubercles, and on section there were visible in the cortex sparsely scattered grey tubercles up to ·5 mm. On the surface of the right kidney and scattered throughout the substance were more numerous similar but slightly larger tubercles, some with minute opacities in the centre.

Suprarenal Bodies.—In the cortex of each suprarenal body there were three or four minute grey tubercles.

Renal Glands.—In each renal gland there were in the cortex firm translucent nodules with more opaque yellowish grey network in the centre.

Coeliac Glands.—Of the coeliac glands, four in number, three were small and normal. The fourth was enlarged and contained five separate nodules, replacing the greater part of the gland substance.

Lumbar Glands.—In one lumbar gland there was a minute yellow gritty focus. A second gland contained in the cortex two early caseous nodules with yellow foci.

On the left side of Pharynx near to the tonsil was a small ulcer with thin undermined edges covered with a yellowish scab.

The Tonsils were normal.

The Epiglottis and Vocal Chords were congested.

The Iliac, Precrural, Pudic, Popliteal, Gluieal, and *Ischiatic Glands* were normal.

Parotid, Submaxillary, and Posterior Pharyngeal Glands were congested and the cortices were somewhat firm.

Microscopical Examination.

(Smear preparations.)

Left Suprarenal Body. — Moderately numerous tubercle bacilli.

Pharynx (*ulcer*).—No tubercle bacilli seen.

Lung, Mediastinal Gland, Prescapular Gland. — Numerous tubercle bacilli in each.

CALF 462.

Subcutaneous inoculation of mixed cultures derived from the original materials of Virus B. XXVI. and Virus H. 56 F.T.

Dose—50 milligrammes of Virus H. 56 and ·02 milligramme of Virus B. XXVI.

Date of Inoculation—June 26, 1906. [Age 8·5 weeks.]

Killed—August 24, 1906. [59 days after inoculation.]

Weights.

	kilos.
June 26, 1906	91·81
August 24, 1906	110·91

Total gain in weight—19·10 kilos.

POST-MORTEM EXAMINATION.

Local Lesion.—On the left side of the neck there was a swelling the size of a goose's egg which on section was found to be a cyst with thin fibrous walls, lined with reddish granulation tissue, and filled with caseo-pus.

Left Prescapular Gland. — The left prescapular gland measured 5·8 by 3·8 by 1·2 cm., and on section showed in the cortex a few scattered yellow foci.

Right Prescapular Gland.—Normal.

Prepectoral Glands.—Normal.

Cervical Glands.—A mid-cervical gland on the left side, the size of a French bean, was firm and contained numerous small yellow tubercles (up to a pinhead) forming a small group at one extremity.

Other cervical glands were normal.

Axillary Glands.—Normal.

Thorax.

Pleura.—Normal.

Lungs.—The lungs were crepitant throughout and contained sparsely scattered and evenly distributed irregular reddish nodules ranging in size up to about a hemp seed; on section all these showed in the centre yellow foci, in some quite large.

The Bronchial and Mediastinal Glands were not enlarged and showed in the cortices scattered irregular yellow foci up to 1 mm., a few of which were perceptibly gritty.

The Pericardium and Heart were normal.

Abdomen.

Peritoneum and Omentum.—Normal.

Intestines.—Normal.

Gastric, Mesenteric, and Colic Glands.—Normal.

Spleen.—The spleen showed a doubtful point.

Liver.—Normal.

Portal Glands.—Normal.

Kidneys.—Normal.

Suprarenal Bodies.—Normal.

Renal, Lumbar, and Iliac Glands.—Normal.

Coeliac Glands.—One coeliac gland showed a group of irregular yellow foci scattered over an area about 1 cm. in diameter.

The Tongue, Tonsils, Larynx, Pharynx, and Trachea were normal.

The Precrural, Pudic, Gluteal, Popliteal, Submaxillary, Retropharyngeal, and Parotid Glands were normal.

Microscopical Examinations.

(Smear preparations.)

Cervical Gland.—A few tubercle bacilli.

Mediastinal Gland.—No tubercle bacilli.

Lung.—A few tubercle bacilli.

CALF 468.

Subcutaneous inoculation with an emulsion made from the Prescapular Gland of Calf 462.

Dose—9·0 cubic centimetres.

Date of Inoculation—August 24, 1906. [Age 15 weeks.]

Died—November 11, 1906. [79 days after inoculation.]

Weights.

	kilos.
August 24, 1906	57·27
November 11, 1906	53·63

Total loss in weight—3·64 kilos.

POST-MORTEM EXAMINATION.

Local Lesion.—In the subcutaneous tissue on the left side of neck there was an oval somewhat prominent tumour weighing 12 ozs. and measuring 12·8 by 9·5 by 3·8 cm. It was adherent to and infiltrated both skin and muscle, and a caseous cord passed to the left prescapular gland. On section it consisted throughout of dense caseated tissue with scattered calcareous streaks.

Left Prescapular Gland.—The left prescapular gland weighed 7 ozs. and measured 10 by 5 by 6·3 cm.;

it consisted throughout, except for a small part of the pelvis, of dense caseous tissue with calcareous streaks and foci.

The Right Prescapular Gland measured 6·3 by 2·5 cm. It was congested and firm at one extremity where there was an early caseous network; in the centre there were two pea-sized caseo-calcareous nodules.

Prepectoral Glands.—The left reniform prepectoral gland was firm at either extremity, where there were discrete caseous tubercles. The right prepectoral glands were normal.

The Tissues in the neighbourhood of glands and tumour were oedematous.

The Axillary Glands were normal.

Cervical Glands.—The left inferior, middle and superior cervical glands were enlarged and caseo-calcareous throughout. In addition, there were numerous small glands on the left side varying from a pea up to a small marble in size, containing caseous tubercles and nodules.

In one right superior cervical gland there was a single caseous nodule.

Thorax.

There was some excess of fluid in the pleural cavities.

On the pleural surface of the Diaphragm there were scattered loosely attached fibro-caseous nodules up to 3 and 4 mm., situated in congested lymphatic fringes.

The outer surface of the Pericardium was similar; the internal surface was normal.

The Tissues of the Posterior Mediastinum were oedematous.

Lungs.—The lungs were dark and congested, and the left was quite airless, sinking in water. On section the whole lobe consisted of irregular caseo-calcareous nodules closely placed and separated by pneumonic lung tissue.

The right lung was similar but just floated on account of some air in the emphysematous margins.

Thoracic Glands.—The bronchial glands were enlarged and consisted practically throughout of firm waxy caseous tissue with opaque yellowish calcareous streaks and foci.

Mediastinal Glands.—The long mediastinal gland measured 11·5 by 5·2 by 3 cm. It was firm and on section contained irregular caseo-calcareous masses replacing the greater part of the gland; other mediastinal glands were similar.

Heart.—Normal.

Abdomen.

On the Peritoneum there were several flat translucent tubercles larger than a wheat grain.

On the Omentum there were sparsely scattered small grey tubercles, the largest the size of a millet seed.

Small Intestine.—In each of two Peyer's patches there was a single caseous nodule the size of a wheat grain.

The Large Intestine was normal.

Gastric Glands.—The majority of the gastric glands contained caseous nodules.

Mesenteric Glands.—The majority of the mesenteric glands contained from 1 to 5 or 6 waxy caseo-calcareous nodules varying from a pea up to 1 cm. in diameter.

Colic Glands.—Several of the colic glands were normal; two contained caseo-calcareous nodules replacing half the substance.

The Rectal Glands were similar.

Spleen.—The spleen weighed 7 ozs. On section it contained in the pulp discrete caseo-calcareous nodules up to 5 mm. in diameter.

Liver.—On the surface of the liver there were visible sparsely scattered tubercles varying from ·5 up to 3 mm. in diameter, most numerous on the convex surface: some projected slightly and had become flattened. On section of the liver they were more sparsely distributed than on the surface, but in the depth there was a caseous nodule with calcareous foci, 8 mm. in diameter.

Portal Glands.—The portal glands were greatly enlarged, one measuring 7·7 by 3·8 cm. They were firm and on section were closely filled with nodules formed of a caseous network with calcareous streaks embedded in translucent tissue.

Gall Bladder was normal.

Kidneys.—The left kidney showed four nodules in the cortex, the largest measuring 6 mm. in diameter, composed of translucent tissue caseating in the centre.

In the right kidney there were sparsely scattered nodules some slightly prominent on the surface and passing radially through the cortex.

Suprarenal Bodies.—The left suprarenal body showed one, the right several opaque grey tubercles the size of rape seeds.

The Renal Lymphatic Glands were large and almost entirely composed of caseated tissue with calcareous foci.

The Coeliac, Lumbar and Iliac Lymphatic Glands were to a great extent replaced by caseo-calcareous nodules.

The Tongue, Tonsils, Larynx, and Pharynx were normal.

The Right Precrural Gland contained a caseo-calcareous nodule in the centre, the size of a wheat grain.

The Left Precrural Gland was normal.

The Left Submaxillary and a Haemo-lymph Gland were caseous throughout.

The Right Parotid, Left Posterior Pharyngeal, Left Popliteal, and both Gluteal Glands had parts of their cortices replaced by caseo-calcareous nodules.

The Left Parotid, Right Posterior Pharyngeal, Right Popliteal, and Ischiatic Glands were normal.

CALF 470.

Subcutaneous inoculation of an emulsion from the Prescapular Gland of Calf 468.

Dose—9·0 cubic centimetres.

Date of Inoculation—November 11, 1906. [Age 26 weeks.]

Killed—April 10, 1907. [150 days after inoculation.]

Tuberculin Test.—February 19, 1907. 100 days after experiment began. Rise of temperature, 1·2° C.

Weights.

	Kilos.
November 11, 1906	101·82
April 10, 1907	129·54

Total gain in weight—27·72.

POST-MORTEM EXAMINATION.

Local Lesion.—The local tumour on the right side of the neck measured 12·7 by 10·2 by 5·5 cm. In the skin at the bottom of a funnel-shaped depression there was a small ulcer, from which the skin around was covered with a dried discharge. On section the tumour was adherent to and slightly infiltrated the skin and muscle; it consisted of caseo-necrotic substance which was softening around the periphery, leaving shaggy walls of pinkish granulation tissue.

Right Prescapular Gland.—The right prescapular gland measured 9 by 5·1 by 5·1 cm. On section about two-thirds of the cortex was replaced by pinkish caseo-necrotic substance; the rest contained discrete caseous nodules. There was great oedema of the subcutaneous tissues on the left side of the neck, about the site of a recent inoculation of tuberculin.

The Left Prescapular Gland was enlarged and firm, and the greater part of the cortex was filled with a fine caseous network.

Prepectoral Glands.—The right round prepectoral gland contained a moderate number of discrete caseo-calcareous tubercles with grey margins.

The Right Reniform Prepectoral Gland contained a few smaller tubercles.

The Left Prepectoral Glands were normal.

The Right Axillary Gland showed two caseo-calcareous nodules. The left axillary gland was normal.

Cervical Glands.—The right inferior cervical and a middle cervical gland were almost replaced by caseo-calcareous tissue.

The right superior cervical gland showed at one extremity discrete fibro-caseous nodules.

The left cervical glands and the gland within the thorax were normal.

Thorax.

Pleura. — The pleural lymphatic fringes were congested and on the parietal pleura there were two flattened fibro-caseous nodules, 6 mm. in diameter.

Lungs.—The lungs showed on the surface and throughout the substance numerous discrete nodules varying from a small pea up to a mass 3 cm. in diameter; they had grey translucent margins with yellow caseous centres, which in the larger nodules were quite soft and caseo-purulent.

Thoracic Lymphatic Glands.—The long mediastinal gland measured 15·2 by 5·1, and on section the cortex was firm and closely filled with fibro-caseous gritty nodules with confluent grey margins. The other mediastinal glands contained similar nodules with marked calcification.

The Bronchial Glands contained similar but more discrete nodules.

Abdomen.

Peritoneum.—On the peritoneum there were five loosely attached translucent tubercles.

Omentum.—The omentum contained one fibro-caseous nodule.

Diaphragm. — On the peritoneal surface of the diaphragm there was a firm fibrous nodule diffusely caseous in the centre, 2 cm. in diameter, and a second nodule the size of a pea.

Intestines.—Normal.

The Mesenteric Glands appeared normal.

Spleen.—The spleen weighed 11 ozs. On section it showed sparsely scattered caseo-calcareous tubercles with grey margins, varying from a millet seed up to a pea in size.

Liver.—In the liver just beneath the surface there were scattered nodules up to 1·3 cm. in diameter; three projected slightly and had fibrous fringes attached to them. On section these nodules consisted of a thick translucent capsule enclosing a caseous centre which was occasionally completely softened. In addition there were numerous very irregular yellowish grey foci (not tuberculous).

Portal Glands.—The portal glands were enlarged and showed moderately numerous fibro-caseous nodules.

Gall Bladder.—Normal.

The Kidneys appeared normal.

Suprarenal Bodies.—Normal.

The Renal Glands showed a few discrete caseo-calcareous tubercles up to a hemp seed in size.

Iliac Glands each contained two fibro-caseous nodules gritty in the centre, up to a pea in size.

Tongue, Tonsils, Larynx, Pharynx and Trachea were normal.

The Right Precrural, Left Submaxillary, Left Posterior Pharyngeal, Right Parotid, and Right Gluteal Glands each contained one or two caseous nodules varying up to 8 mm. in diameter, some calcareous, others softening in the centre.

Coeliac Glands. — One contained discrete caseous nodules with fibroid margins and gritty centres, up to a pea in size. Two others were normal.

The Left Popliteal Gland showed a part of its cortex firm translucent and congested around the margins.

The Right Popliteal, Left Parotid, Right Posterior Pharyngeal, Left Precrural, Pudic and Ischiatic Glands were normal.

Testicles.—Normal.

Microscopical Examinations.

(Smear preparations.)

Lung.—One tubercle bacillus seen.

Portal Gland.—No tubercle bacilli seen.

Bronchial Gland.—Two tubercle bacilli seen.

Liver.—No tubercle bacilli seen.

CALF 472.

Subcutaneous inoculation of an emulsion made from the Spleen of Calf 468.

Dose—9·0 cubic centimetres.

Date of inoculation—November 11, 1906. [Age—18·5 weeks.]

Killed—April 12, 1907. [152 days after inoculation.]

Tuberculin Test.—February 19, 1907. Dose, 4·0 cc. of tuberculin, 100 days after experiment began. Reacted. Rise of temperature, 1·9° C.

Weights.

	Kilos.
November 11, 1906	69·09
April 12, 1907	68·18

Loss on initial weight—0·91 kilo.

POST-MORTEM EXAMINATION.

Local Lesion.—On the right side there was a pear-shaped swelling measuring 12·7 by 7·1 by 5·1 cm. On section it was partly cystic, containing turbid fluid and a pinkish necrotic sequestrum partly adherent to the walls; the walls were roughened by projecting calcareous granules. There was slight infiltration of the muscle.

Right Prescapular Gland.—The right prescapular gland measured 9 by 5·1 by 5·1 cm. On section it consisted throughout of dense pinkish caseo-necrotic substance with calcareous foci.

Left Prescapular Gland.—The left prescapular gland contained a single caseo-calcareous nodule.

Prepectoral Glands.—The right reniform prepectoral gland had about half its substance filled with tubercles.

The right round prepectoral gland was firm and resembled the preceding.

The left prepectoral glands were normal.

The Right Axillary Gland showed a few gritty tubercles.

Cervical Glands.—The right inferior cervical gland was enlarged and firm and was replaced by caseo-calcareous tissue.

The right middle cervical gland contained collections of caseo-calcareous tubercles.

The right superior cervical gland showed a large caseous nodule.

The left inferior and middle cervical glands showed a few discrete submiliary tubercles.

The left superior cervical gland contained one caseo-calcareous nodule.

Thorax.

Lungs.—The lungs did not collapse normally ; they were oedematous and contained numerous caseo-calcareous nodules surrounded, in a majority of cases, by areas of consolidation ; they were most closely placed in the posterior lobes, which felt firm to the touch. Many of the larger nodules contained in the centre mucopurulent substance with gritty foci.

Thoracic Lymphatic Glands.—The long mediastinal gland was enlarged, and the greater part of the cortex was replaced by caseo-calcareous tissue consisting of aggregations of tubercles. The other mediastinal and bronchial glands were also extensively replaced.

Abdomen.

Intestines.—Small intestine :—Situated in the long Peyer's patch were seventeen submucous nodules ranging in size from 3 mm. up to 8 mm. On section these contained soft yellow caseous substance. There were only three others in the rest of the small intestine, of which two were in the mucous membrane.

The large intestine appeared normal.

The Mesenteric and Gastric Glands contained hard gritty nodules and tubercles.

The Colic Glands appeared normal.

Spleen.—The spleen weighed 5 ozs. There were several projecting nodules beneath the surface. On section the substance contained scattered caseo-calcareous nodules, up to a hemp seed in size.

Liver.—On the surface of the liver there were several flattened translucent nodules with caseous foci ; there were also a few caseo-calcareous tubercles slightly embedded in the substance. On section no tubercles were seen in the deep parts of the substance.

Portal Glands.—The portal glands contained moderately numerous irregular caseo-calcareous tubercles.

Kidneys.—In the cortices of the kidneys there were sparsely scattered calcareous tubercles the size of millet seeds.

Both Renal and one Lumbar Gland were closely filled with caseo-calcareous tubercles ; other lumbar glands appeared normal.

The Iliac Glands showed a few discrete submiliary calcareous tubercles.

The Coeliac Glands showed collections of caseo-calcareous tubercles, one gland being almost replaced.

Diaphragm.—On the peritoneal surface around the tendon of the diaphragm, on the right side, there were moderately numerous somewhat flattened translucent nodules with caseous centres.

The Tongue, Tonsils, Larynx, Pharynx, and Trachea were normal.

Various Lymphatic Glands.

The Left Precrural, Right Popliteal, Right Gluteal, and Left Submaxillary Glands each showed one or two caseo-calcareous nodules.

The Right Precrural, Left Popliteal, Left Gluteal, and Right Submaxillary Glands were normal.

The Posterior Pharyngeal Glands contained moderately numerous caseo-calcareous tubercles, up to a hemp seed in size.

Microscopical Examinations.

(Smear preparations.)

Lung.—Moderately numerous tubercle bacilli.

Mediastinal Gland.—A moderate number of tubercle bacilli.

Prepectoral Gland, Cervical Gland.—A few tubercle bacilli in each.

INVESTIGATION OF TUBERCLE BACILLI DERIVED FROM TUBERCULOSIS OCCURRING NATURALLY IN THE HORSE.

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